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18 UNITED STATES DISTRICT COURT
19
20 NORTHERN DISTRICT OF CALIFORNIA

21 BRYAN LEE, ALEXANDER DALZIEL,
22 BENJAMIN MURRAY, JARED VAN
23 VALKENBURG, BRETT CLAVIER, BEN
24 FABER, ANTHONY ANNESE, MICHAEL
25 REILLY, JOSHUA LODGE, ERIC ROMERO,
26 JONATHAN CLAY, JOHN HICKS, MARY
27 STOCKTON, ZACHARY PRATER, and
28 BENJAMIN ANDERSON, individually and on
behalf of all others similarly situated,

Plaintiffs,

v.

MICRON TECHNOLOGY, INC., MICRON
SEMICONDUCTOR PRODUCTS, INC.,
SAMSUNG ELECTRONICS CO., LTD.,
SAMSUNG SEMICONDUCTOR, INC., SK
HYNIX, INC., and SK HYNIX AMERICA,
INC.,

Defendants.

Case No. _____

CLASS ACTION COMPLAINT

JURY TRIAL DEMANDED

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Plaintiffs bring this action on their own behalf, and as a putative class action on behalf of all others similarly situated in the United States. Plaintiffs, by and through their attorneys, based on their individual experiences, the independent investigation of counsel and consultants, and information and belief, allege as follows:

I. INTRODUCTION AND OVERVIEW OF THE CONSPIRACY

1. In this Complaint, Plaintiffs, among other things, make the following key allegations:

- Based on the statements of a confidential witness, that Sewon Chun, the Samsung executive in charge of DRAM, *intentionally leaked Samsung's confidential plans to raise DRAM prices in early 2016 to an industry analyst as a signal to Hynix and Micron to also raise prices*, only after, according to the same confidential witness, Samsung had taken unilateral action in late 2015 in an attempt to raise DRAM prices by shelving DRAM wafers that failed to stop DRAM prices from falling;
- That after DRAM prices doubled from 2016 to 2017, the exact same Samsung executive, Sewon Chun, repeatedly publicly attributed DRAM price increases to restrictions on supply among the Defendants, including stating on April 27, 2017 that “*supply and demand continued to be solid and price rose strongly due to restrictions of industry supply*,” and stating on July 27, 2017 that “*due to restriction of industry supply, supply and demand remained solid and price continued to rise*”;
- That *after Micron's CEO stated in March 2016 that it would “be foolish for it to be the first ones to take capacity off,” Samsung and Hynix each announced the following month, April 2016, that they were both reducing capacity*, and the next month, Micron's CEO stated that “there has been some relatively encouraging news that has been disseminated via various channels and from the competitors about . . . capital spending going into next year, particularly for DRAM . . . *we all are going to either benefit or be hurt by excess supply in the marketplace*” and so “*I actually remain bullish on . . . the DRAM business and the actions of the competitors in the marketplace*”;

- 1 • That after Defendants’ executives made statements in 2016 encouraging their putative
2 competitors to minimize supply growth for the benefit of the industry, Defendants then made
3 subsequent statements in 2017 attributing the industry’s recent success to a shared commitment
4 to restraining supply and encouraging each other to continue to restrain supply, with Micron’s
5 CFO on June 6, 2017 stating that continued success “over the course of a multi-year period”
6 would require the industry’s competitors to be disciplined about not adding supply because he
7 foresaw a “*good balance between supply and demand as long as capital discipline is*
8 *exercised,*” followed the next month, July 2017, by Samsung stating that “*we will refrain from,*
9 *for example, increasing market share, fighting on volume*”;
- 10 • Based on economic analysis, that Samsung, Micron, and Hynix acted against their own unilateral
11 self-interest through DRAM output cuts in 2016 that cost each company tens of millions of
12 dollars, which would have been irrational without a collusive agreement, with *Samsung first*
13 *unilaterally reducing output and costing itself close to \$50 million in profits* as well as
14 significant market share, then followed *the next quarter by corresponding output reductions*
15 *from Micron and Hynix that cost them tens of millions of dollars each*;
- 16 • Based on the statements of a confidential witness, that senior executives from Samsung, Micron,
17 and Hynix attended private DRAM-specific conferences where *they “could talk to competitors”*
18 *about “future volume” and “overall volume expectations”*;
- 19 • Related to Defendants’ prior price-fixing conspiracy, that Micron’s chief strategy officer
20 throughout the current conspiracy period, had previously testified at a criminal trial of a Hynix
21 executive for the prior conspiracy that he had directly fixed prices with the Hynix executive; that
22 a Hynix executive who had pled guilty in 2006 to the prior conspiracy was *promoted by Hynix to*
23 *chief marketing officer in charge of all memory products in 2007 while he was still in prison*
24 and had then remained at Hynix until at least 2015; and *statements from a Samsung confidential*
25 *witness that some of the very same executives who participated in the prior price-fixing*
26 *conspiracy are still employed at Samsung*;
- 27 • With regard to the class of DRAM Devices at issue in this indirect purchaser action, personal
28 computers, network servers, cellular phones, tablets, computer graphical processing units, and

computer DRAM memory products, that *each is a type of product for which DRAM constitutes approximately 5-50% of the total cost, and often significantly more, as well as specific evidence that rising DRAM prices during the class period caused corresponding increases in the price of the DRAM Devices*, thus plausibly suggesting that the DRAM and DRAM Device markets are “inextricably intertwined” and some or all of the overcharges on DRAM caused by Defendants’ collusive conduct was passed-on to purchasers of these products;

2. Defendants – Samsung, Micron, and Hynix – are the three companies that control nearly 100 percent of the Dynamic random access memory (“DRAM”) market, with Samsung controlling the largest share.¹ As of mid-2017, these Defendants collectively controlled at least 96% of worldwide DRAM market share.

3. In late 2015, Defendants faced a problem. Vigorous competition between Defendants in 2014 and 2015 had caused DRAM prices to fall dramatically. Confidential Witness 1 (“CW 1”) is a former U.S.-based Samsung executive.² He explains that, in late 2015, Samsung made a unilateral decision to act on its own and stockpile, rather than sell, DRAM wafers in an attempt to limit supply, with the goal to stop DRAM price erosion and ideally raise DRAM prices. But this legal, unilateral action did not work and DRAM prices in the industry continued to fall precipitously through the end of 2015.

4. In early 2016, Samsung switched from unilateral self-action to attempts to signal to the other Defendants to embark on concerted action. According to CW 1, in early 2016, Sewon

¹ Dynamic random access memory (“DRAM”) is one of the most common forms of semiconductor memory. DRAM is made from silicon wafers, and it is widely used as a component in digital electronics. “Defendants” include: Micron Technology, Inc. (“Micron Technology”); Micron Semiconductor Products, Inc. (“Micron Semiconductor”) (collectively “Micron”); Samsung Electronics Co., Ltd. (“SEC”); Samsung Semiconductor, Inc. (“SSI”) (collectively “Samsung”); SK Hynix, Inc. (f/k/a Hynix Semiconductor, Inc.) (“SK Hynix Korea”); SK Hynix America, Inc. (f/k/a Hynix Semiconductor America, Inc.) (“SK Hynix America”) (collectively “SK Hynix” or “Hynix”).

² Confidential Witness 1 is a former Samsung memory executive who worked at Samsung North America’s headquarters in San Jose, California during at least part of the conspiracy (Class) period.

1 Chun, an executive vice president of Memory Marketing for Samsung who had responsibility for
 2 how much DRAM Samsung would produce and what types of pricing should be offered to
 3 customers, told Pablo Temprano, a Samsung executive in the United States, to intentionally leak to
 4 Sean Muir, an industry analyst at Cleveland Research, confidential information that Samsung was
 5 raising prices on DRAM.³ Mr. Muir was chosen because he published a monthly report on DRAM
 6 prices that was closely monitored by the Defendants. CW 1 understood based on his conversation
 7 with Mr. Temprano that Mr. Temprano was reluctant to convey the information to Mr. Muir, but that
 8 he eventually did so in a telephone call. CW 1 believed that Samsung's purpose in intentionally
 9 divulging this confidential information about future prices was to inform Samsung's chief
 10 competitors that Samsung was raising DRAM prices and that Micron and Hynix should follow suit.
 11 CW 1 observed that shortly after this incident, DRAM prices began to rise.

12
 13 5. During the same time period, Micron invited the other Defendants to cut production,
 14 coupling this invitation with a clear reassurance that Micron would not try to take DRAM market
 15 share if Samsung or Hynix cut production. If the industry collectively cut production, then prices
 16 would rise – which is exactly what the data show happened. On March 30, 2016, Micron's CEO,
 17 Mark Durcan stated that Micron would “*be foolish to be the first ones to take capacity off.*”
 18 Micron's CFO, Ernie Maddock, stated that Micron would not unilaterally cut production, explaining
 19 that “*it's a really ill-advised move to be unilaterally cutting production.*” But at the same time, Mr.
 20 Maddock reassured Samsung and Hynix that “*our focus isn't on market share.* Our focus is on
 21 making sure that we've deployed equivalent advanced technology . . . so that we're not incentivizing
 22 others to play for market share.” Sean Muir of Cleveland Research issued a report on Micron's
 23 earnings call the following day that emphasized that Micron had “*maintained it would be foolish for*
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 25
 26
 27

28 ³ CW1's knowledge is based on conversations that he had with Mr. Temprano.

1 *them to take capacity offline before Samsung or Hynix saying that at their fixed cost structure it's*
 2 *a really bad move to cut production*" – indicating that Micron's statements were understood by
 3 industry participants to be a clear invitation to the other Defendants to be the first ones to cut DRAM
 4 supply.

5
 6 6. Within a month, both Samsung and Hynix responded to Micron's invitation to cut
 7 production by publicly stating that they would cut their DRAM production. On April 20, 2016,
 8 Samsung stated that its DRAM bit growth had decreased by low single-digits over the prior quarter.
 9 Samsung also stated that "we don't expect there to be major increases in supply of DRAM in the
 10 near future." On April 27, 2016, Hynix stated that on its earnings call that "DRAM suppliers' CapEx
 11 execution is projected to decrease as we move into the second half." Deutsche Bank issued a report
 12 on this Hynix earnings call that emphasized "management toned down its capex expectations for
 13 2016, especially for DRAM. SK Hynix expects its total capex to be down [year over year] in 2016,
 14 with some capex allocated to R&D purposes and not for capacity improvement."

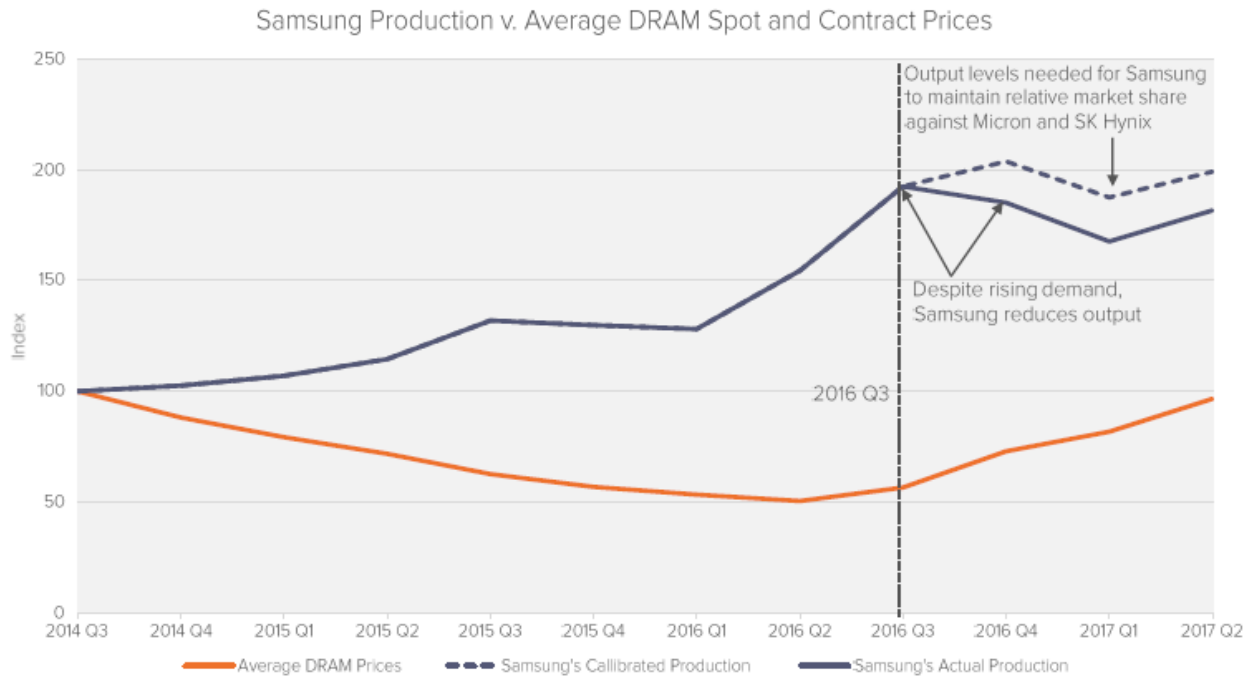
15
 16 7. The following month, on May 25, 2016, Micron's CEO Mark Durcan recognized that
 17 its competitors were planning to cut supply and Durcan encouraged further production cuts, stating
 18 that "*there has been some relatively encouraging news that has been disseminated via various*
 19 *channels and from the competitors about . . . capital spending going into next year, particularly*
 20 *for DRAM.*" Durcan encouraged his competitors to reduce wafers, stating that "*[i]f wafers actually*
 21 *come down as we're starting to hear some equipment suppliers talk about, then it could be mid- to*
 22 *high-teens [supply growth rate], in which case that would be more beneficial*" for DRAM prices.
 23 Durcan emphasized that there are only three suppliers in the market, and "*we all are going to either*
 24 *benefit or be hurt by excess supply in the marketplace.*" He expected Micron and its competitors to
 25 maintain supply discipline because "there's a natural tightening tendency absent, somebody wanting
 26 to do something different than that. And so...I actually remain bullish on...the DRAM business and
 27 the actions of the competitors in the marketplace." The very next week, Deutsche Bank issued a
 28

1 report on June 1, 2016 that it was “encouraged that both Samsung and SK Hynix confirmed that their
2 DRAM capex will decline y/y . . . while emphasizing the importance of profitability.”

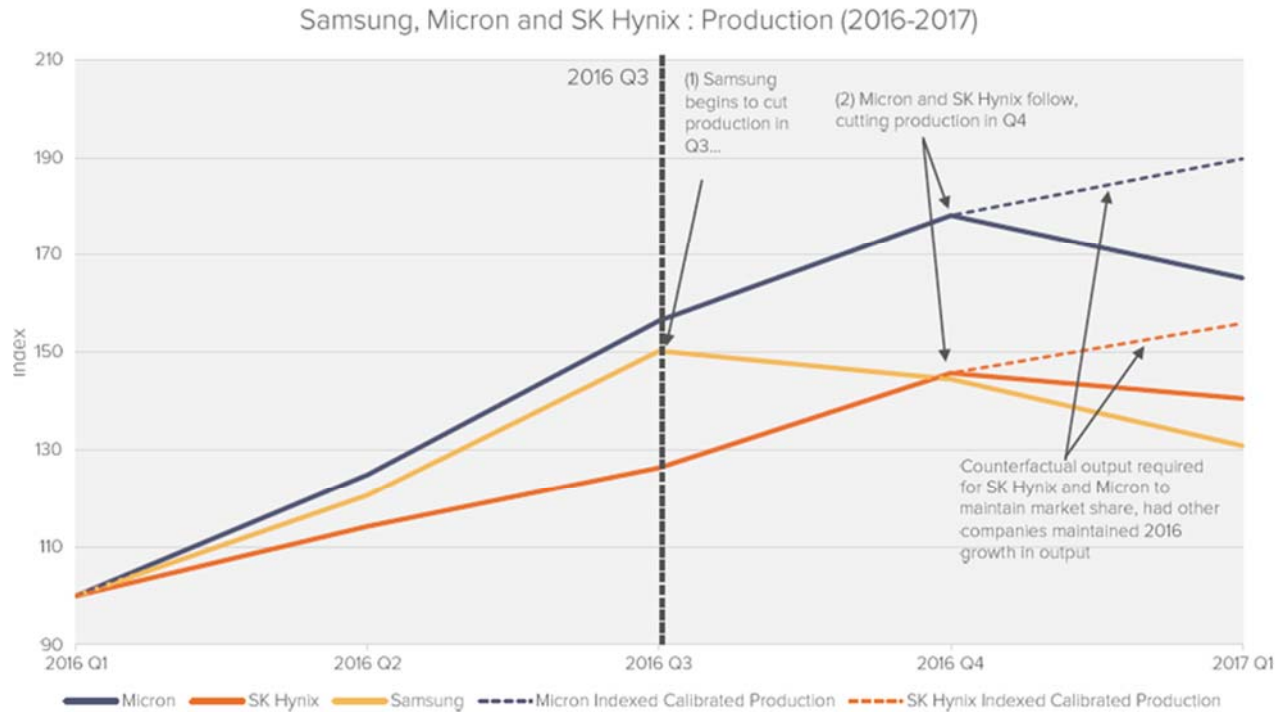
3 8. On July 18, 2016, a Deutsche Bank analyst report noted an unprecedented change in
4 DRAM industry behavior with production cuts occurring despite industry profitability, stating that
5 *“our historical data show that DRAM capex cuts only happen when the industry has been*
6 *unprofitable. However, DRAM makers have cut capex in 2016 despite the industry remaining*
7 *highly profitable, proving the industry has become more capex-disciplined.”*

8
9 9. In addition to the statements, Bloomberg market data indicates that Defendants took
10 actions contrary to self-interest that would have been irrational and perilous in the absence of a
11 collusive agreement. First, Samsung cut DRAM production in Q3 2016, even as demand for DRAM
12 continued to rise. Samsung’s production cut was against its unilateral self-interest as it cost an
13 estimated \$47 million in immediate profits for Q3 if it had simply maintained its production at Q2
14 levels. Samsung’s voluntary action sacrificed approximately 5% of the total market share by this
15 output reduction, a complete reversal of prior behavior in the 2014-2015 period of fiercely
16 competing to gain market share. Richard Posner recognizes that “declining market shares of leaders”
17 is a plus factor potentially indicative of cartel conduct.⁴ Samsung’s output cut is shown in the
18 following chart.
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22
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24
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28 ⁴ See Richard A. Posner, Antitrust Law, 79-93 (2d Ed. 2001).



10. Second, in a competitive market, Samsung's rivals would have either maintained or increased output to gain market share in the face of rising demand, which is part of the reason why Samsung's conduct would have been irrational without knowledge that its rivals would not also decrease output. And indeed, the following quarter – Q4 2016 – both Micron and Hynix actually cut their output, as shown in the following chart. Micron and Hynix's actions are indicative of a collusive agreement and also against their own unilateral self-interest, as they would have gained market share and significant profits if they had either simply maintained their output levels or raised their output levels. Based on available data, Micron and Hynix sacrificed respectively \$30 million and \$27 million in lost profits by failing to maintain their output growth rate.



11. In addition to Samsung's new output restrictions, CW 1 also observed a change in behavior during the conspiracy period by Samsung for its DRAM pricing. CW 1 regularly attended quarterly meetings between Samsung Electronics executives, based in Korea, and Samsung Semiconductor executives, based in North America where DRAM pricing was discussed. CW 1 stated that Samsung Electronics executives in Korea controlled supply and had ultimate authority on prices. Pricing decisions for U.S. customers emanated out of Korea – not the U.S. headquarters in San Jose. Samsung Semiconductor executives in North America handled sales of DRAM and were compensated based on their total revenue, thus incentivizing them to compete on DRAM pricing to win business and increase their own commissions. CW 1 observed that in 2016 and 2017, Samsung Electronics executives in Korea were less likely than before to grant pricing decreases on DRAM to win business as requested by Samsung Semiconductor executives. Samsung Semiconductor executives expressed frustration at this change in Samsung's behavior because it cost them potential sales. Samsung's new restrictions on its sales force was another action by Samsung against its

1 unilateral self-interest, because it cost Samsung business, revenue, and market share against that of
2 its rivals.

3 12. A second Confidential Witness and former Samsung North America employee,
4 Confidential Witness 2 (“CW 2”), confirmed that final pricing decisions were made in the “black
5 box” in Korea and that “there was never visibility” into the process used to make those pricing
6 decisions.⁵

8 13. Throughout the Class Period, Defendants maintained their efforts to coordinate their
9 DRAM supply decisions, which is reflected in public comments by Defendants that urged each other
10 to keep industry supply in check and confirmed each Defendant’s own supply plans. Defendants
11 each made public statements affirming their commitment to the common plan to curtail supply, and
12 to not compete for each other’s market share by supply expansion. For example, Defendants
13 informed the other Defendants through public statements that they would *keep total wafer capacity*
14 *flat* in order to constrain DRAM supply growth, that they would only *grow DRAM supply between*
15 *15-20% in 2017, even as DRAM demand grew 20-25%*, and that they would *refrain from taking*
16 *each other’s market share*.

18 14. On September 8, 2016, Micron emphasized that neither Micron nor its competitors
19 were adding wafers that would increase available supply, with Micron’s CFO reiterating public
20 signals from Samsung and Hynix that they, like Micron, were not adding wafer capacity: “while I
21 would love to tell you that our competitors have sent us a memo telling us what their expansion plans
22 are, unfortunately I can’t report that, but certainly we read the same thing that each of you read and it
23 does suggest that the focus of capital spend in 2017 is going to be NAND as opposed to DRAM on
24 the part of many folks in the competitive space.” Micron’s CEO emphasized that “*there’s no sign*
25
26

27 _____
28 ⁵ Confidential Witness 2 is a former Samsung memory senior director who worked at Samsung North America’s headquarters in San Jose, California.

1 *anywhere in the market that suggests there's a plan to expand DRAM wafer capacity.* And in that
 2 environment . . . we would expect to see bit growth that is this sub-20% level . . . and *the reality is*
 3 *under 20% is good*, given how we see the demand environment shaping up.” Micron’s CFO
 4 reassured the industry that Micron had no plans to increase supply despite increasing demand: “Q:
 5 And it doesn’t look like you guys are changing the supply side from Micron at all with the better
 6 demand, right? A: *Well, I mean we have basically announced what we intend to do in terms of bit*
 7 *growth and we’re sticking to that.*”

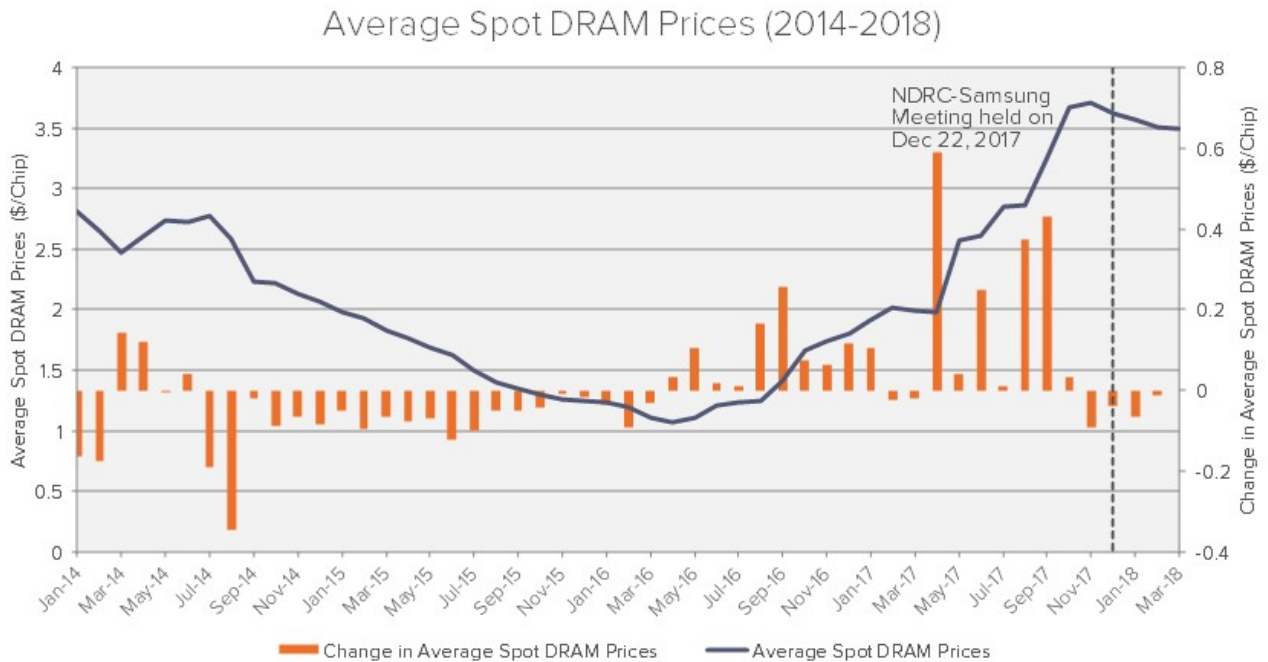
9 15. The following month, Sewon Chun, the Samsung executive identified by the CW 1 as
 10 responsible for intentionally leaking future price information, reassured the industry that Samsung
 11 would continue to limit its investment in DRAM and keep its growth in line with the market: “given
 12 the fact that *we haven’t done much investments in DRAM this year, we are expecting our growth*
 13 *rates to come down and be in line with market bit growth in DRAM next year.* Once again, as we
 14 have always mentioned, regarding DRAM, *our focus is not to increase our market share but to*
 15 *maximize our profits.*” Mr. Chun’s comments affirmed that Samsung would continue to match
 16 Micron’s behavior of restraining supply and keeping bit growth below 20%.

18 16. On March 23, 2017, Micron’s CEO, in response to an analyst question, encouraged
 19 Samsung to avoid adding wafers as they had done prior to the conspiracy: “Q: . . . *People are*
 20 *obviously worried about Samsung adding a bunch of wafers. Why would that not happen this*
 21 *time? A: I don't know why they would intentionally repeat the mistake from last cycle. They*
 22 *probably are enjoying making good margins.*” The following month, on April 27, 2017, Samsung
 23 responded that it would not add additional wafer capacity, stating that it was “investing capacity to
 24 make up for the loss that happens” in wafer capacity from technology transitions but that otherwise
 25 “we have no plans of additional capacity.”
 26
 27
 28

1 17. On June 6, 2017, Micron’s CFO Ernie Maddock attributed the industry’s recent
2 positive performance to keeping supply growth “constrained” below demand growth, and then
3 Micron again encouraged the three Defendants to remain disciplined about not adding supply: “*it*
4 *feels very much as if you’ll have good balance between supply and demand as long as capital*
5 *discipline is exercised. And certainly Micron has indicated the difference to be reasonably*
6 *disciplined with its capital investments, and other industry competitors in their particular public*
7 *disclosure have said similar things.*” The following month, Samsung and Hynix responded with
8 assurances that they would continue to restrain supply. Samsung stated “As we have always
9 emphasized in the conference calls, we will refrain from, for example, increasing market share,
10 fighting on volume.” Hynix reiterated that it expected the supply shortage in DRAM to continue,
11 stating that “supply is expected to keep falling short of demand growth despite the increase in mobile
12 DRAM supply. For the year, supply growth is likely to remain slightly slower than demand growth.”
13
14

15 18. Defendants’ statements were matched with conduct, specifically with regard to supply
16 restraints and pricing – affirmed in industry reports and analyses – which reinforced each’s
17 commitment to their common scheme. During the conspiracy period, Samsung’s Sewon Chun
18 repeatedly attributed rising DRAM prices to a shared commitment to restricting DRAM supply
19 among the Defendants. On April 27, 2017, Mr. Chun stated that “supply and demand continued to be
20 solid and price rose strongly due to restrictions of industry supply.” On July 27, 2017, notably a
21 month after Micron’s Maddock encouraged the maintenance of “capital discipline” in the industry,
22 Mr. Chun stated that “due to restriction of industry supply, supply and demand remained solid and
23 price continued to rise.” Then, on October 31, 2017, Mr. Chun stated that because “the overall
24 restriction of industry supply stays, price continued to rise on the . . . supply-and-demand
25 conditions.”
26
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19. As a result of Defendants' concerted actions to curtail supply and forego market share expansion, the market data shows that Defendants were able to abruptly and precipitously raise DRAM prices by approximately 350% throughout the Class Period, and reap enormous profits, as shown in the below chart:



20. On December 22, 2017 the NDRC and Samsung held a meeting regarding coordinated action among the Defendants in the DRAM industry. On February 1, 2018, it was reported that Samsung and the NDRC had entered into a Memorandum of Understanding where Samsung agreed to increase manufacturing capacity. The NDRC investigation and the agreement with Samsung caused Defendants' conduct to change as they increased capacity and the Class Period came to an end after February 1, 2018. DRAM prices fell as a result of the change in behavior. In November 2018, Wu Zhenguo, head of the Chinese Anti-Monopoly Bureau, stated that the "investigation into these three companies [Samsung, Hynix, and Micron] has made important progress . . . it has yielded massive evidence."

21. Other “plus factors” also point squarely to collusion by Defendants. For example, the DRAM market has all of the hallmark features of a market conducive to collusion. DRAM is a commodity. The DRAM market is consolidated, with only small number of players – the three Defendants – holding a lion’s share of the market (96%). The DRAM market has high barriers to entry, and demand for DRAM is inelastic. While DRAM prices rose during the Class Period, costs did not rise so as to justify those increases, nor did changes in DRAM technology, and there were no unanticipated spikes in demand that could explain the rapid price increases (indeed, Defendants’ statements and actions show a joint effort to grow supply *at a slower rate* than expected demand increases).

22. The plus factors supporting the existence of this (effective) conspiracy are also strongly supported by information provided by confidential witnesses, including the statements by CW 1 and CW 2 discussed above. Moreover, discussions between Defendants are pervasive. For example, Defendants are each the leading members in the Joint Electron Device Engineering Council (“JEDEC”), a trade organization that establishes industry-wide standards for DRAM. According to Confidential Witness 3 (“CW 3”), a former Hynix marketing executive, JEDEC holds meetings approximately six times a year in various locations.⁶ The meetings are attended by approximately 80 to 100 executives, with Samsung, Hynix, and Micron each sending leadership teams. JEDEC provided an ideal setting for Defendants to discuss future business plans. CW 3 explained that “at JEDEC, you could talk to competitors about what they were seeing in future volume. You can talk about overall volume expectations.” This is directly contrary to JEDEC’s own antitrust guidelines, which state that, “absent prior legal clearance and legal guidance, there should be no discussion or exchange of information . . . regarding future plans concerning the production, distribution

⁶ CW 3 is a former Hynix marketing executive, who worked at Hynix during part of the conspiracy (Class) period.

1 or marketing of particular products; or any other statistics or figures pertaining to a company's
2 business operations."

3 23. Executives from the Defendants also frequently socialized together. CW 3 stated that
4 "people in the industry know each other personally" and that employees at the Defendants "have a
5 friendly relationship. They have dinner. They have breakout discussions." CW 3 also noted that the
6 commodity nature of DRAM meant that the Defendants "are competitors but they are also partners."

7
8 24. Defendants also used third-party research firms to exchange information. One such
9 firm is Gartner Research, which CW 3 stated would include industry trend information. CW 3 said
10 these reports were critical for Hynix to understand the long-term volume for the entire industry and
11 used such reports to assist in making major decisions, such as building another production plant.
12 Gartner employees interviewed Hynix, Samsung, and Micron DRAM employees to write its reports.
13 DRAM prices depended on supply and demand levels and the Gartner reports frequently discussed
14 forecasted supply levels.

15
16 25. The plausibility of the conspiracy alleged is also buttressed by the fact that
17 Defendants have previously been convicted of conspiring to fix prices of DRAM and many of the
18 same executives involved in the prior conspiracy continue to hold senior positions at the Defendants.
19 As part of the conspiracy, Defendant DRAM manufacturers agreed in 2001 to reduce DRAM supply
20 in order to raise prices. As part of this agreement, the DRAM manufacturers held a meeting in the
21 fall of 2001 where they each agreed to reduce production. In 2005, the United States Department of
22 Justice ("DOJ") brought criminal charges against the very same Defendants named here (and other
23 makers of DRAM that existed at the time) for participating in a conspiracy to fix prices of DRAM
24 sold in the United States between 1999 and 2002. Samsung and SK Hynix⁷ pleaded guilty to the
25

26
27
28 ⁷ In 2012, Hynix Semiconductor, Inc. and Hynix Semiconductor America, Inc. changed their
corporate names to SK Hynix, Inc. and SK Hynix America, Inc., respectively, after the companies

1 DOJ's charges – and paid some of the largest criminal fines in history for their illegal conduct.
2 Micron also admitted its participation in the earlier DRAM conspiracy, but was given amnesty from
3 DOJ prosecution in exchange for its cooperation under the DOJ's Antitrust Leniency Program.⁸
4 Fourteen individual employees of Defendants also pleaded guilty for their participation in the earlier
5 DRAM conspiracy – paying fines of \$250,000 each, and serving prison sentences ranging from
6 seven to fourteen months. Defendants and their co-conspirators also collectively paid over \$650
7 million to settle civil price-fixing claims related to their prior conduct in the DRAM market.
8

9 26. Numerous executives of Defendants who were involved in the prior conspiracy hold
10 key leadership positions at Defendants today. Michael Sadler was Chief Strategy Officer at Micron
11 until December 2018. Mr. Sadler previously testified at a criminal trial of a Hynix executive, Gary
12 Swanson, that he had discussed pricing at two core accounts with the Hynix executive and that based
13 on those discussions, Mr. Sadler concluded that he had an “understanding” with Mr. Swanson that
14 Micron and Hynix were “on the same page.” Mr. Sadler also testified that on one occasion, Mr.
15 Swanson told him that Hynix was raising prices and Mr. Sadler responded that Micron would also
16 raise prices. Mr. Sadler further testified that during the prior conspiracy, he participated in a
17 “worldwide tour” to seek the cooperation of other manufacturers to restrict production. Mr. Sadler
18 described this trip to the DOJ as “slam-dunk” illegal, and acknowledged that he was an “originator of
19 that idea.” During the prior conspiracy period, Mr. Sadler also engaged in direct conversations with
20 the president of Samsung Semiconductor regarding the problem of oversupply in the DRAM market.
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25 _____
26 were acquired by SK Group. For simplicity, this Complaint uses the term “SK Hynix” or “Hynix”
throughout.

27 ⁸ Under the DOJ's Antitrust Leniency Program, a “leniency applicant” can receive amnesty from
28 criminal prosecution and/or reduced fines, for admitting its own violations and cooperating with
authorities.

1 27. Three different Hynix executives who pleaded guilty for their participation in the
2 prior DRAM conspiracy continued to hold senior positions at Hynix after they were released from
3 prison. Kun Chul Suh is currently the CEO for SK Hynix America Inc. Choon Yub Choi, an
4 executive at Hynix, held various positions at Hynix, including VP, managing director at SK Hynix
5 UK, and managing director at Hynix Semiconductor Deutschland GmbH until January 2017. Dae
6 Soo Kim, an executive at Hynix, pleaded guilty in 2006 and was promoted by Hynix in November
7 2007 to chief marketing officer, responsible for all semiconductor sales and marketing, ***while he was***
8 ***still in prison***. Hynix's CEO said that Mr. Kim in his new position would "strengthen market sensing
9 capabilities." As of 2015, Mr. Kim was an advisor at Hynix. The DOJ plea agreements for each of
10 these three executives stated that they had participated in the conspiracy by engaging in
11 communications with other DRAM producers regarding pricing.
12

13 28. Sun Woo Lee, a Samsung executive, pleaded guilty in 2006 for participation in the
14 prior DRAM conspiracy. Following his guilty plea, Mr. Lee held various positions at Samsung,
15 including President of Samsung Taiwan, President of Samsung Germany, and from 2014-2015,
16 President and Chief Executive Officer of Samsung Electronics Europe. CW 2, a former Samsung
17 executive, stated that Samsung executives involved in the prior price-fixing conspiracy are still at
18 Samsung. CW 2 further noted that because some of the same Samsung executives who were
19 involved in the price-fixing conspiracy are still with the company, he would not be surprised if
20 Samsung was caught again repeating some of its same price-fixing behaviors in the DRAM market.
21

22 29. Sewon Chun, the Samsung executive responsible for leaking pricing information
23 during the current conspiracy, worked in the DRAM memory marketing division for Samsung during
24 the prior conspiracy period and reported to Il Ung Kim, who was general manager of memory
25 marketing for Samsung. Il Ung Kim pleaded guilty for price-fixing during the prior conspiracy
26 period and received the longest ever imprisonment for a foreign defendant charged with price-fixing
27
28

1 in the United States. As part of his guilty plea, the DOJ stated that Kim had admitted “encouraging
2 the involvement of other Samsung employees in the DRAM conspiracy.”⁹

3 30. CW 1 explained that it was “ingrained” at Samsung to “not put anything in writing”
4 after their prior price fixing convictions. Senior Samsung executives also would respond via face-to-
5 face communications rather than writing if they were emailed by a new Samsung executive who was
6 not familiar with Samsung’s practice of avoiding written communications. CW 1 also stated that
7 Samsung’s Korea-based executives used heavily encrypted software to store sensitive information,
8 such as competitors’ roadmaps.

9
10 31. Plaintiffs are purchasers of specific kinds of “DRAM Devices” – namely cellular
11 phones, computers, network servers, tablets, graphical processing units (“GPUs”), and computer
12 memory products – for which DRAM is a significant component cost and for which the markets for
13 DRAM and DRAM Devices are otherwise inextricably intertwined. Plaintiffs’ class definition is
14 limited to purchasers of these specific types of products only (*see* Part XII, *infra*), and thus for the
15 purposes of this complaint, the term DRAM Devices refers to these products only.¹⁰

16
17 32. The inextricable relationship between the cost of DRAM and the price for DRAM
18 Devices – and thus the impact of the elevated DRAM prices caused by Defendants’ collusion on
19 elevated prices for DRAM Devices – is stark. For example, the prices for computer memory product
20 in the following exemplar chart shows that rising DRAM prices during the conspiracy between 2016
21 and 2018 led to corresponding increases in the price on Amazon of a popular computer memory
22 product, a Corsair 16 GB Memory Kit. By early 2018, the price of the Corsair Vengeance *had*

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24
25 ⁹ *Sixth Samsung Executive Agrees to Plead Guilty to Participating in DRAM Price-fixing Cartel*,
26 U.S. Department of Justice (April 19, 2007),
https://www.justice.gov/archive/atr/public/press_releases/2007/222770.htm (last visited Apr. 29,
2021).

27 ¹⁰ Plaintiffs’ class definition does not include other potential kinds of products that contain
28 DRAM, such as televisions, cars, and automobiles. Plaintiffs’ class definition also does not include
indirect purchasers of DRAM for industrial applications such as military or aviation services.

increased by over 200% from its low of \$60 in June 2016 to a high of \$220 in April 2018. Then, after the Chinese NDRC reported its investigation into DRAM price-fixing, there was a dramatic decline in the price for the Corsair Vengeance computer memory product, dropping to \$75 by the middle of 2019 – close to the same price that it had prior to the conspiracy.



33. Defendants themselves acknowledged the inextricable relationship between the markets for DRAM and DRAM devices, as rising prices for DRAM caused corresponding rises in the prices of DRAM devices such as computers. On May 24, 2017, after a rapid rise in DRAM prices, Ernie Maddock, CFO of Micron, reassured industry analysts that rising DRAM prices would not lead to a decrease in demand for DRAM products, stating that “what’s driving PC [personal computer] growth is very high performance or ultra-light form factor PCs which rely on more concentration of memory or particularly high performance memory and so the value equation there, if you’re about to pay \$1500 for a PC because it delivers capability to you, you’re probably willing to pay \$1550 if in fact that’s what it costs.”

34. Defendants combined and contracted to fix, raise, maintain, or stabilize the prices at which DRAM was sold in the United States from at least June 1, 2016 to February 1, 2018 (the

1 “Class Period”). Defendants’ conspiracy artificially inflated prices for DRAM throughout the supply
 2 chain that were ultimately passed through to Plaintiffs and members of the Classes, causing them to
 3 pay more for DRAM Devices than they otherwise would have absent Defendants’ conspiracy.

4 35. Defendants’ conspiratorial conduct between 2016 and 2018 violated Section One of
 5 the Sherman Act and the antitrust, consumer protection, and unfair competition laws of various
 6 states. As a result, Plaintiffs and members of the Classes paid artificially inflated prices for DRAM
 7 Devices, and thereby suffered antitrust injury to their business or property.
 8

9 II. JURISDICTION AND VENUE

10 36. This Court has jurisdiction over the instant matter pursuant to 28 U.S.C. § 1332(d)
 11 and the Class Action Fairness Act of 2005 (“CAFA”), 28 U.S.C. § 1711, *et seq.*, which vest original
 12 jurisdiction in the district courts of the United States for any multi-state class action where the
 13 aggregate amount in controversy exceeds \$5 million and where the citizenship of any member of the
 14 class of plaintiffs is different from that of any defendant. The \$5 million amount-in-controversy and
 15 diverse citizenship requirements of CAFA are satisfied in this case.
 16

17 37. Venue is appropriate in this district under 28 U.S.C. § 1391(b) and (c). During the
 18 Class Period many of the Defendants transacted business, were found, or had agents in this District
 19 and because a substantial portion of the affected interstate trade and commerce described below has
 20 been carried out in this District.
 21

22 38. This Court has personal jurisdiction over each Defendant because, *inter alia*, each
 23 Defendant: (a) transacted business throughout the United States, including in this District;
 24 (b) participated in the sale and distribution of DRAM or DRAM-containing products throughout the
 25 United States, including in this District; (c) had substantial contacts with the United States, including
 26 in this District; and/or (d) was engaged in an illegal conspiracy that was directed at and had the
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1 intended effect of causing injury to persons residing in, located in, or doing business throughout the
2 United States, including in this District.

3 39. Defendants engaged in conduct both inside and outside the U.S. that caused direct,
4 substantial, reasonably foreseeable, and intended anticompetitive effects upon interstate commerce
5 within the United States.
6

7 40. The activities of the Defendants were within the flow of, were intended to, and did
8 have, a substantial effect on interstate commerce of the United States. Defendants' products are sold
9 in the flow of interstate commerce.

10 41. As described above in the previous section in more detail, DRAM manufactured
11 abroad by Defendants and sold for use in products that contain DRAM, either manufactured in the
12 United States or manufactured abroad and sold in the United States, are goods brought into the
13 United States for sale, and therefore constitute import commerce. To the extent any DRAM was not
14 purchased in the United States and do not constitute import commerce, Defendants' unlawful
15 activities with respect thereto, as more fully alleged herein during the Class period, had, and continue
16 to have, a direct, substantial, and reasonably foreseeable effect on United States commerce. The anti-
17 competitive conduct, and its effects on United States commerce described herein, proximately caused
18 antitrust injury to the Plaintiffs and members of the Classes in the United States.
19

20 42. By reason of the unlawful activities alleged herein, Defendants substantially affected
21 commerce throughout the United States, causing injury to the Plaintiffs and members of the Classes.
22 Indeed, by reason of the unlawful activities alleged herein, Defendants' conduct substantially
23 affected commerce within each state in the United States, including but not limited to within the
24 states of Iowa, Kansas, Minnesota, Mississippi, Missouri, New Mexico, New York, Oregon,
25 Tennessee, Utah, Virginia, Wisconsin, and the District of Columbia, where Defendants' unlawful
26 conduct caused Plaintiffs' injury. Defendants, directly and through their agents, engaged in a
27
28

1 conspiracy affecting all states (including but not limited to Iowa, Kansas, Minnesota, Mississippi,
2 Missouri, New Mexico, New York, Oregon, Tennessee, Utah, Virginia, Wisconsin, and the District
3 of Columbia) to fix or inflate prices of DRAM, which unreasonably restrained trade and adversely
4 affected the market for DRAM and products containing DRAM, including DRAM Devices.

5
6 43. Defendants' conspiracy and wrongdoing described herein adversely affected persons
7 in the United States who purchased DRAM or products containing DRAM for personal use and not
8 for resale, including Plaintiffs and members of the Classes.

9 44. Intra-district Assignment: Under Civil Local Rule 3-2(c) and (e), this action is
10 properly assigned to the San Jose Division because a substantial part of the events giving rise to the
11 claims arose in this District, and two of the named Defendants have their U.S. headquarters in this
12 District.

13 14 **III. THE PARTIES**

15 **A. Plaintiffs**

16 45. Plaintiff Bryan Lee is a resident of the District of Columbia. During the class period,
17 Plaintiff Lee purchased a Dell Model Laptop for personal use and not for resale.

18 46. Plaintiff Alexander Dalziel is a resident of Spirit Lake, Iowa. During the class period,
19 Plaintiff Dalziel purchased a Team TForce DRAM memory product for personal use and not for
20 resale.

21 47. Plaintiff Benjamin Murray is a resident of Kansas City, Kansas. During the class
22 period Plaintiff Murray purchased a Samsung Galaxy S7 for personal use and not for resale.

23
24 48. Plaintiff Jared Van Valkenburg is a resident of Hermantown, Minnesota. During the
25 class period, Plaintiff Van Valkenburg purchased a G.SKILL DRAM memory product for personal
26 use and not for resale.

1 49. Plaintiff Brett Clavier is a resident of Biloxi, Mississippi. During the class period,
2 Plaintiff Clavier purchased a Corsair DRAM memory product for personal use and not for resale.

3 50. Plaintiff Ben Faber is a resident of Columbia, Missouri. During the class period,
4 Plaintiff Faber purchased an iPhone 8+ and two iPhone XSs, a Refurbished 2017 13 inch MacBook
5 pro, an iPad Air 2, a Mac Mini and a Refurbished iMac 17, all for personal use and not for resale.
6

7 51. Plaintiff Anthony Annese is a resident of Las Cruces, New Mexico. During the class
8 period, Plaintiff Annese purchased a Corsair Desktop DRAM memory kit for personal use and not
9 for resale.

10 52. Plaintiff Michael Reilly is a resident of Albuquerque, New Mexico. During the class
11 period, Plaintiff Reilly purchased a Pixel 2 cell phone for personal use and not for resale.
12

13 53. Plaintiff Joshua Lodge is a resident of Larchmont, New York. During the class period,
14 Plaintiff Lodge purchased a G.Skill DRAM memory product for personal use and not for resale.

15 54. Plaintiff Eric Romero is a resident of Portland, Oregon. During the class period,
16 Plaintiff Romero purchased a Corsair DRAM memory product for personal use and not for resale.

17 55. Plaintiff Jonathan Clay is a resident of Salem, Oregon. During the class period,
18 Plaintiff Clay purchased a Corsair DRAM memory product for personal use and not for resale.

19 56. Plaintiff John Hicks is a resident of Memphis, Tennessee. During the class period,
20 Plaintiff Hicks purchased a G.Skill DRAM memory product for personal use and not for resale.
21

22 57. Plaintiff Mary Stockton is a resident of Ivins, Utah. During the class period, Plaintiff
23 Stockton purchased 2 LG PowerX smartphones, a Samsung Galaxy Core and a gaming computer, all
24 for personal use and not for resale.

25 58. Plaintiff Zachary Prater is a resident of Purcellville, Virginia. During the class period,
26 Plaintiff Prater purchased a G.Skill DRAM memory product for personal use and not for resale.
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28

1 59. Plaintiff Benjamin Anderson is a resident of Twin Lakes, Wisconsin. During the class
2 period, Plaintiff Anderson purchased a G.Skill DRAM memory product for personal use and not for
3 resale.

4 **B. Defendants**

5 60. Defendant Micron Technology, Inc. (“Micron Technology”) is a Delaware
6 corporation with its principal place of business at 8000 South Federal Way, Boise, Idaho. During the
7 Class Period, Micron Technology manufactured, sold, and distributed DRAM throughout the United
8 States.

9 61. Defendant Micron Semiconductor Products, Inc. (“Micron Semiconductor”) is an
10 Idaho corporation located at 8000 South Federal Way, Boise, Idaho. Micron Semiconductor is a
11 wholly owned and controlled subsidiary of Micron Technology. During the Class Period, Micron
12 Semiconductor sold and distributed DRAM to customers throughout the United States, including
13 sales of DRAM through its retailing arm, Crucial Technology, Inc. (“Crucial”), and Crucial’s
14 website, Crucial.com.

15 62. Defendants Micron Technology and Micron Semiconductor, and Crucial are
16 collectively referred to herein as “Micron.”

17 63. Defendant Samsung Electronics Co., Ltd. (“SEC”) is a Korean corporation and
18 maintains its executive offices at 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea.
19 During the Class Period, SEC manufactured, sold, and distributed DRAM throughout the world,
20 including the United States.

21 64. Defendant Samsung Semiconductor, Inc. (“SSI”) is a California corporation located at
22 3655 North First Street, San Jose, California 95134. SSI is a wholly owned and controlled
23 subsidiary of SEC. During the Class Period, SSI sold and distributed DRAM throughout the United
24 States.

65. Defendants SEC and SSI are collectively referred to herein as “Samsung.”

66. Defendant SK Hynix, Inc. (f/k/a Hynix Semiconductor, Inc.) (“SK Hynix Korea”) maintains its head offices at 2091, Gyeongchung-daero, Bubal-eub, Icheon-si, Gyeonggi-do, Korea. During the Class Period, SK Hynix Korea manufactured, sold, and distributed DRAM throughout the world, including the United States.

67. Defendant SK Hynix America, Inc. (f/k/a Hynix Semiconductor America, Inc.) (“SK Hynix America”) is a California corporation located at 3101 North First Street, San Jose, California 95134. SK Hynix America is a wholly owned and controlled subsidiary of SK Hynix Korea. During the Class Period, SK Hynix America sold and distributed DRAM throughout the United States.

68. Defendant SK Hynix and SK Hynix America are collectively referred to herein as “SK Hynix” or “Hynix.”

69. SEC and SK Hynix Korea identified above, are at times referred to herein as the “Korean Defendants.”

70. The Micron Defendant entities, SSI, and SK Hynix America identified above, are at times referred to herein as “U.S. Defendants.”

C. Agents and Non-Party Co-Conspirators

71. Defendants’ officers, directors, agents, employees, or representatives engaged in the conduct alleged in this Complaint in the usual management, direction, or control of Defendants’ business or affairs.

72. Defendants are also liable for acts done in furtherance of the alleged conspiracy by companies they acquired through mergers and acquisitions.

73. When Plaintiffs refer to a corporate family or companies by a single name in this Complaint, they are alleging that one or more employees or agents of entities within that corporate family engaged in conspiratorial acts on behalf of every company in that family. The individual

1 participants in the conspiratorial acts did not always know the corporate affiliation of their
2 counterparts, nor did they distinguish between the entities within a corporate family. The individual
3 participants entered into agreements on behalf of their respective corporate families. As a result,
4 those agents represented the entire corporate family with respect to such conduct, and the corporate
5 family was party to the agreements that those agents reached.
6

7 74. Each of the Defendants acted as the agent of, co-conspirator with, or joint venture
8 partner of the other Defendants and co-conspirators with respect to the acts, violations, and common
9 course of conduct alleged in this Complaint. Each Defendant or co-conspirator that is a subsidiary of
10 a foreign parent acted as the United States agent for DRAM and/or DRAM Devices made by its
11 parent company.
12

13 75. Various persons, partnerships, sole proprietors, firms, corporations, and individuals
14 not named as Defendants in this lawsuit, and individuals, both known and unknown, participated as
15 co-conspirators with Defendants in the offenses alleged in this Complaint, and performed acts and
16 made statements in furtherance of the conspiracy. Plaintiffs reserve the right to name some or all of
17 these persons and entities as Defendants at a later date.
18

19 **IV. DESCRIPTION OF DRAM**

20 **A. What is DRAM?**

21 76. DRAM is one of the most common forms of semiconductor memory. DRAM is used
22 to store bits of data in capacitors, which are situated within integrated circuits. DRAM is widely used
23 in digital electronics, such as in personal computers ("PCs"), network servers, cellular phones,
24 tablets, televisions, cameras, and also in industrial applications, such as in automotive, military, and
25 aviation devices.

26 77. "RAM" or "Random Access Memory" is the memory or information storage in a
27 computer that is used to store running programs and data for the programs. Data (information) in the
28

RAM can be read and written quickly in any order. Normally, the RAM is in the form of computer chips, such as DRAM. The “D” in DRAM stands for “dynamic,” meaning that it is a dynamic form of RAM that must have its storage cells refreshed or given a new electronic charge every few milliseconds, or data contained in the DRAM will be lost.

78. DRAM is a stand-alone product. In other words, it must be inserted into a device, such as a laptop or a cellular phone, to serve any function:



79. Because DRAM has no independent utility, the value of, and thus, demand for DRAM is driven by the demand for products that need volatile (or dynamic) memory.

B. How is DRAM Manufactured?

80. Defendants manufacture DRAM in fabrication plants (commonly called “fabs”). Defendants manufacture DRAM at their fabs in Korea and China.

81. DRAM is made from silicon wafers. To make DRAM, silicon wafers are cut into individual chips called “dice.” The dice are printed with electronics, and are then considered complete. Capacity for DRAM is often discussed in terms of new “wafer starts.”

1 82. DRAM chips are classified into types based on the number of data transfers a chip can
2 process per cycle. DRAM types are most commonly denoted by the term Double Data Rate
3 (“DDR”), and are suffixed by numbers 2-6. For example, DRAM types include DDR3 and DDR4.

4 83. DRAM chips are also sometimes assembled by Defendants (or their contract agents)
5 into DRAM modules, in order to be used in certain DRAM-containing devices. DRAM modules are
6 a packaging option necessitated by, and developed for, the computer segment of the electronics
7 market. A DRAM module is made from DRAM chips, a printed circuit board (“PCB”), and a
8 bonding agent to attach the chips to the PCB. The vast majority of the cost of a DRAM module is the
9 cost of chips. The close relationship between modules and chips is reflected by the price parity
10 between them. At any given time, the price of modules is only slightly above the aggregate price of
11 the loose chips mounted on the PCB.
12

13 84. DRAM is also classified into categories based on its end-use. For example, PC
14 DRAM is used in PC-related products such as in desktop and notebook products. Mobile DRAM is
15 used in mobile devices, such as phones, smartphones, and tablets. Server DRAM is used in server
16 applications, such as workstations and servers.
17

18 **C. How is DRAM Sold to Direct Purchasers?**

19 85. The vast majority of DRAM is sold by Defendants to Original Equipment
20 Manufacturers (“OEMs”), who then incorporate DRAM into the manufacturing of DRAM-
21 containing products, including DRAM Devices.
22

23 86. Micron sells some DRAM directly to consumers on its retail website, Crucial.com.

24 87. During the Class Period, approximately 90% of DRAM was sold pursuant to contracts
25 between DRAM buyers and sellers, with the remaining 10% being sold on the spot market.
26
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1 88. Contract prices are negotiated in advance, and specify the quantity of the product that
2 will be delivered by the seller to the buyer over an agreed to timeframe. Contracts last approximately
3 two weeks to one month, when they can be renegotiated.

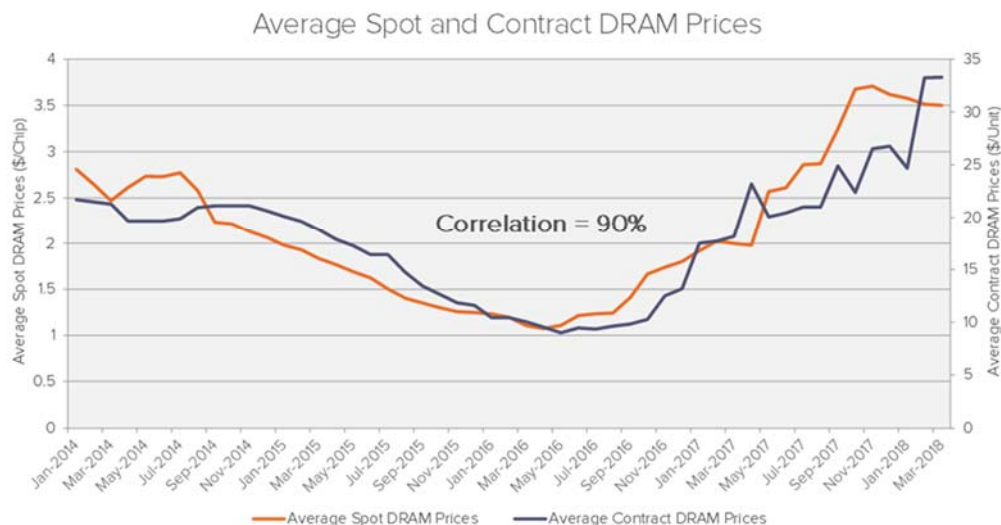
4 89. The spot market is an informal market consisting of intermediaries and vendors that
5 sell DRAM to the white box PC segment,¹¹ which is comprised primarily of Chinese manufacturers,
6 unbranded PC manufacturers, and unbranded module makers.¹²

7
8 90. The spot and contract markets are interrelated, with contract pricing being pegged to
9 the spot price. Spot market pricing serves as an important benchmark for contract negotiations with
10 OEMs. As subscribers to these services, each day, Defendants received these lists (before the general
11 public), and used them as the benchmark for negotiating prices with contract customers. Therefore,
12 when Defendants agreed to limit competition for the supply of DRAM, their conduct affected not
13 just the spot price for DRAM but contract prices as well. As a result, contract prices and spot prices
14 follow each other closely, as shown in the chart below.
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26 ¹¹ A white box is a PC or server without a well-known brand name. It applies to systems
27 assembled by small system integrators and to home-built computer systems assembled by end users
from parts purchased separately through a retail channel.

28 ¹² A module is a circuit board that contains DRAM integrated circuits that are installed into the
memory slot on a computer motherboard.

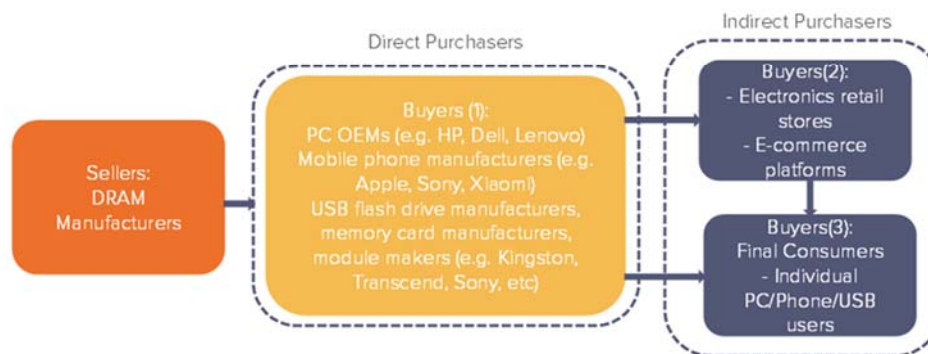
Contract and Spot Price Correlation

**D. How is DRAM Sold to Indirect Purchasers?**

91. Direct purchasers of DRAM use DRAM in products that they manufacture, including DRAM Devices such as computers and cellular phones. Final goods with embedded DRAM, such as laptops and phones, are then sold on to indirect purchasers of DRAM. The chart below sets forth an example of how DRAM is sold to indirect purchasers:

DRAM Supply Chain

- The majority of DRAM manufacturers sell to direct purchasers on a contract basis (i.e. based on contract price)
- Final goods with embedded DRAM (e.g. laptops, phones, etc.) are then passed over to indirect purchasers



E. The Markets for DRAM and DRAM Devices.

92. DRAM has no independent utility, and thus has value only as either components of other products or as add-ons to other products (such as for computer memory products). The demand for DRAM thus directly derives from the demand for such products/devices. As discussed, the members of the putative classes of Plaintiffs in this Complaint are limited to purchasers of certain DRAM Devices, specifically cellular phones, computers, network servers, tablets, graphical processing units (“GPUs”), and computer memory products.

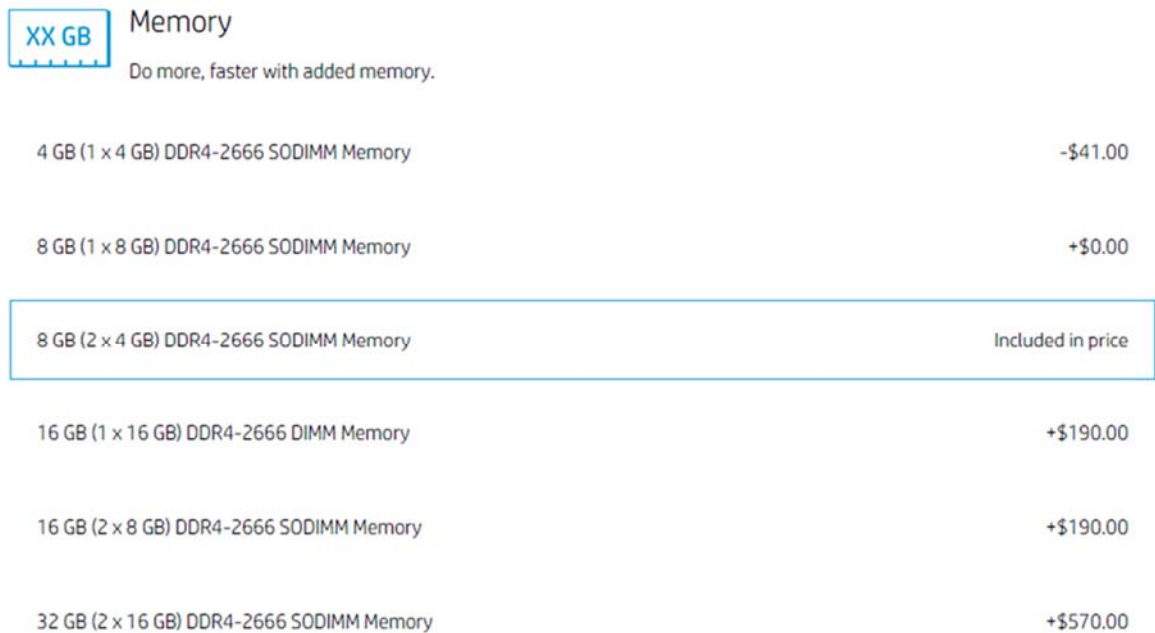
93. The market for DRAM and the markets for the DRAM Device products into which they are placed are inextricably linked and intertwined because the DRAM market is designed specifically to serve and in fact does serve the DRAM Device markets. The market for DRAM and the markets for DRAM Devices are, for all intents and purposes, inseparable in that one would not exist without the other. For example, Ernie Maddock, Micron’s CFO, explained at a December 6, 2017 presentation that DRAM “is essential to that improved user experience” for DRAM Devices such as computers and cellular phones. His answer was in response to a question from an industry analyst that noted “demand in DRAM seems relatively inelastic, which is a positive thing when prices have moved up as much [as] they are” and that it “seems like the PC makers have been able to pass these increases on to their customers.”

94. Plaintiffs are purchasers of DRAM Devices for which DRAM is a significant cost component, and generally comprises between 5-50% of the overall cost to manufacture DRAM Devices.

95. DRAM is a significant cost component of computers and increases in DRAM prices lead to increases in computer prices. During the conspiracy period, industry analysts specifically noted that rising DRAM prices had led to increases in the average sales prices (“ASPs”) of personal computers (“PCs”). Robert Cihra, an analyst at Guggenheim Securities, stated in September 2017

that “we see PC ASPs up almost entirely due to higher memory costs.” Cihra noted that the rising memory prices had led to the first year of positive revenue growth in the PC Market since 2010, but that this was completely driven by rising PC ASPs, as PC market unit volume had actually declined by approximately 4% year-over-year.

96. The importance of DRAM as a component cost for personal computers is shown by the fact that changes in the amount of memory included in otherwise identical PC configurations will result in a changed price for the PC. For example, as shown on the Hewlett Packard website following the class period, different choices of memory configurations for a HP business PC resulted in differences of cost totaling approximately \$600 depending on the DRAM memory chosen:



The screenshot shows a 'Memory' configuration section on a website. It features a header 'Memory' with a sub-header 'Do more, faster with added memory.' Below this is a list of memory options with their respective prices. The option '8 GB (2 x 4 GB) DDR4-2666 SODIMM Memory' is highlighted with a blue border and labeled 'Included in price'.

Memory Configuration	Price
4 GB (1 x 4 GB) DDR4-2666 SODIMM Memory	-\$41.00
8 GB (1 x 8 GB) DDR4-2666 SODIMM Memory	+\$0.00
8 GB (2 x 4 GB) DDR4-2666 SODIMM Memory	Included in price
16 GB (1 x 16 GB) DDR4-2666 DIMM Memory	+\$190.00
16 GB (2 x 8 GB) DDR4-2666 SODIMM Memory	+\$190.00
32 GB (2 x 16 GB) DDR4-2666 SODIMM Memory	+\$570.00

97. DRAM is also a significant component cost for cellular phones, as volatile memory, which includes DRAM, accounts for approximately 5-10% of the bill of materials cost for recent cellular phones manufactured by Apple and Samsung, according to estimates by industry analysts:

Device	Volatile Memory (\$) *	% of BOM
Samsung Galaxy S9+	39.00	10%
Samsung Note 8	36.00	10%
Samsung Galaxy S8+	18.00	5%
Apple iPhone 8+	26.50	8%
Apple iPhone X	25.50	7%

*DRAM is defined as volatile memory

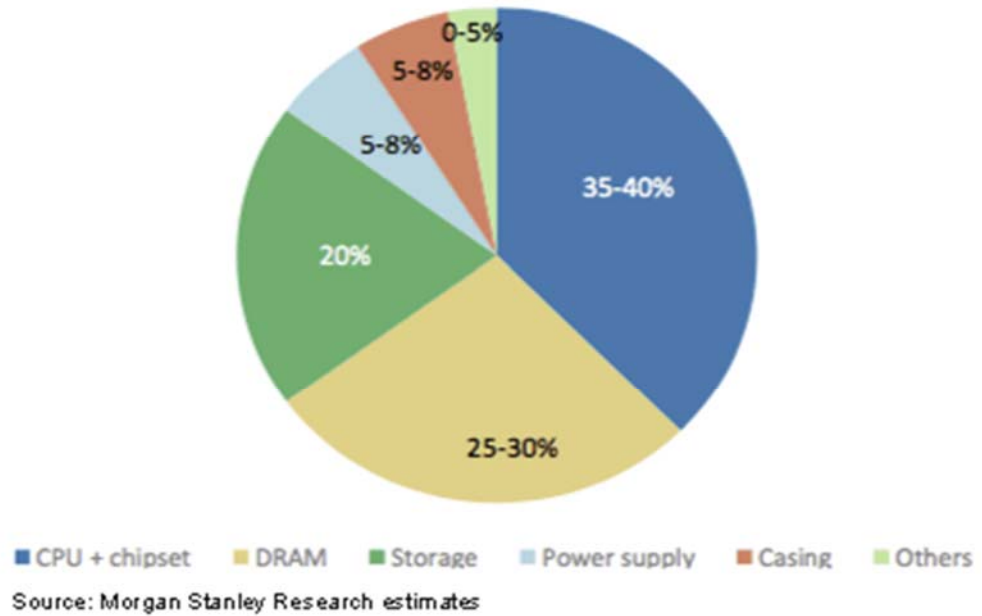
Note: "BOM" refers to a Bill of Materials, which is a list of raw materials, sub-assemblies, intermediate assemblies, sub-components parts and quantities of each needed to manufacture an end product

Source: Tech Insights, <https://www.notebookcheck.net/The-OnePlus-7-Pro-only-costs-324-to-build-Comparison-with-the-Galaxy-S10.427693.0.html>

98. DRAM accounts for approximately 25-30% of the component costs for network servers, as shown in the following chart of data center server bill of materials costs that was prepared based on Morgan Stanley research estimates.¹³

¹³ *Commodity Buyers for Data Center Cloud Hardware Rack Solutions Transformed by Supply Chain Outsourcing*, Venture Outsource, <https://www.ventureoutsource.com/contract-manufacturing/commodity-buyers-data-center-cloud-hardware-rack-solutions-transformed-supply-chain-outsourcing/> (last visited Oct. 25, 2019).

Purchasing data center server bill of materials (BOM)



99. DRAM's significance as a component cost for networks servers is also shown by the effect of different DRAM configurations on the price of an HP network server in late 2019. The base cost of a HPE Proliant DL380 server was \$1,499.99 with 16 GB of Memory. Simply by increasing the amount of memory on the server to 64 GB raised the base price to \$2,083.99. HPE's website specifically identifies that the increase in memory produces a charge of \$504.40, which then causes an ensuing raise to the base price of over 25%. Increasing the amount of memory on the server to the maximum available of 576 GB raises the price to \$13,123.91 – an increase in price of nearly 1,000% that is entirely driven by changes in the amount of base memory. The differences are seen in the below images from late 2019 on the HPE website:

CURRENT CONFIGURATION

Processor	1 x HPE DL380 Gen10 Intel Xeon-B 3204 6-Core (1.90GHz 8.25MB L3 Cache) Processor Kit	Available
Memory	1 x HPE 16GB (1x16GB) Dual Rank x8 DDR4-2933 CAS-21-21-21 Registered Memory Kit	
Internal Storage	(None selected)	
Operating System	(None selected)	
Management software	(None selected)	
Support	(None selected)	
		Base package \$1499.99
		Total Price \$1499.99
		Add to cart

CURRENT CONFIGURATION

Processor	1 x HPE DL380 Gen10 Intel Xeon-B 3204 6-Core (1.90GHz 8.25MB L3 Cache) Processor Kit	Available
Memory	4 x HPE 16GB (1x16GB) Dual Rank x8 DDR4-2933 CAS-21-21-21 Registered Memory Kit 8 x HPE 64GB (1 x 64GB) Dual Rank x4 DDR4-2933 CAS-21-21-21 Registered Memory Kit	
Internal Storage	(None selected)	
Operating System	(None selected)	
Management software	(None selected)	
Support	(None selected)	
		Base package \$1499.99
		Configured upgrades + \$11543.92
		Assembly Fee \$80.00
		Total Price \$13123.91
		Add to cart

CURRENT CONFIGURATION

Processor	1 x HPE DL380 Gen10 Intel Xeon-B 3204 6-Core (1.90GHz 8.25MB L3 Cache) Processor Kit	Available
Memory	4 x HPE 16GB (1x16GB) Dual Rank x8 DDR4-2933 CAS-21-21-21 Registered Memory Kit	
Internal Storage	(None selected)	
Operating System	(None selected)	
Management software	(None selected)	
Support	(None selected)	
		Base package \$1499.99
		Configured upgrades + \$504.00
		Assembly Fee \$80.00
		Total Price \$2083.99
		Add to cart

100. DRAM is also a significant cost component for tablets. As shown in the following chart, following the class period, DRAM has constituted between 5 and 6% of the component costs of particular tablets where DRAM-specific information is available, and DRAM in combination with other volatile memory, for other tablet models, has constituted between 8 and 25% of the component costs.

Device	Volatile Memory (DRAM) (\$)	Volatile and Non-Volatile (DRAM and NAND) (\$)	Total BoM (\$)	% of BOM (DRAM)	% of BOM (DRAM and NAND)
Samsung Galaxy Tab	(not available)	51.00	205.22	(not available)	25%
Apple Tablet*	(not available)	39.00	347.23	(not available)	11%
Microsoft Surface	13.90	47.50	298.82	5%	16%
iPad Mini (16 GB)	(not available)	15.50	188.00	(not available)	8%
iPad 2 (32 GB - GSM/HSPA Version)	(not available)	65.70	326.60	(not available)	20%
iPad Air 2(16 GB - WiFi& Cellular)	18.00	24.75	305.00	6%	8%

101. DRAM can constitute up to 40-50% of the cost of a graphical processing unit. An analysis of the bill of materials cost for an AMD Radeon VII GPU concluded that DRAM constituted \$320 of the estimated \$650-\$700 in bill of materials cost and specifically noted that “memory costs almost half the whole card.”¹⁴

102. During the conspiracy period, an analyst report by Mizuho in the fall of 2017 specifically noted that GPU pricing was up 25% in the last six months and partially attributed the rise in GPU prices to “constrained short DRAM supply and pricing.”¹⁵

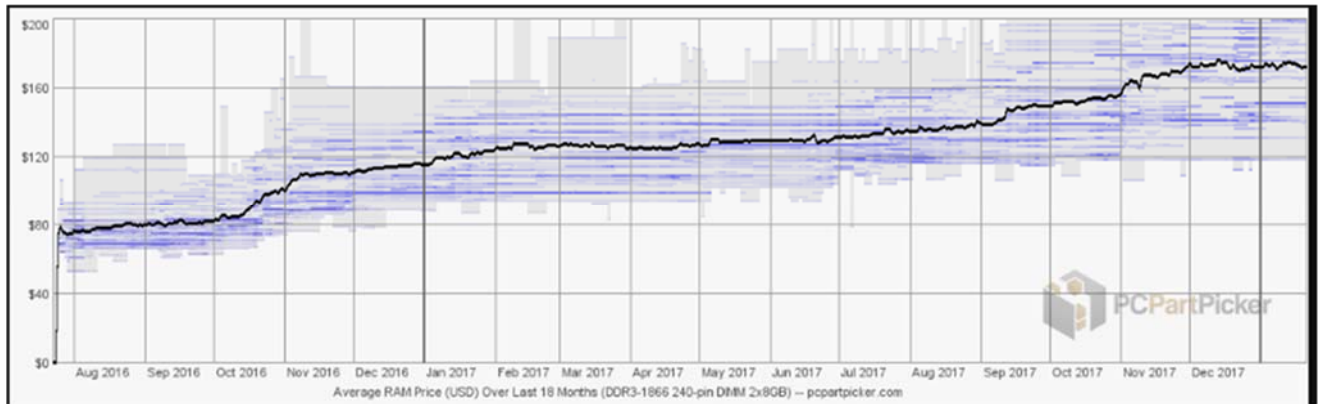
103. DRAM is *the primary* cost component for computer memory products that consumers purchase to either add memory to their personal computers or when they are constructing their own personal computers. As shown in the exemplar chart presented in paragraph 32, *supra*, rising DRAM prices between 2016 and 2018 led to corresponding increases in the price on Amazon of a popular

¹⁴ Fuad Abazovic, *Radeon VII Production Cost \$650+*, Fudzilla (Jan. 28, 2019), <https://www.fudzilla.com/news/graphics/48020-radeon-vii-production-cost-650> (last visited Apr. 29, 2021).

¹⁵ Tiernan Ray, *Nvidia: Crypto Demand for GPUs Very Strong, Could Cool in December, Says Mizuho*, Barron's (Sept. 22, 2017), <https://www.barrons.com/articles/nvidia-crypto-demand-for-gpus-very-strong-could-cool-in-december-says-mizuho-1506091907> (last visited Apr. 29, 2021).

1 computer memory product, a Corsair 16 GB Memory Kit. By early 2018, the price of the Corsair
 2 Vengeance had increased by over 200% from its low of \$60 in June 2016 to a high of \$220 in April
 3 2018.

4 104. Aggregated analysis on the prices of memory products showed similar trends. For
 5 example, one website showed that the price of 2x8 GB DDR3 memory products rose from
 6 approximately \$80 in mid-2016 to over \$160 by the beginning of 2018.
 7



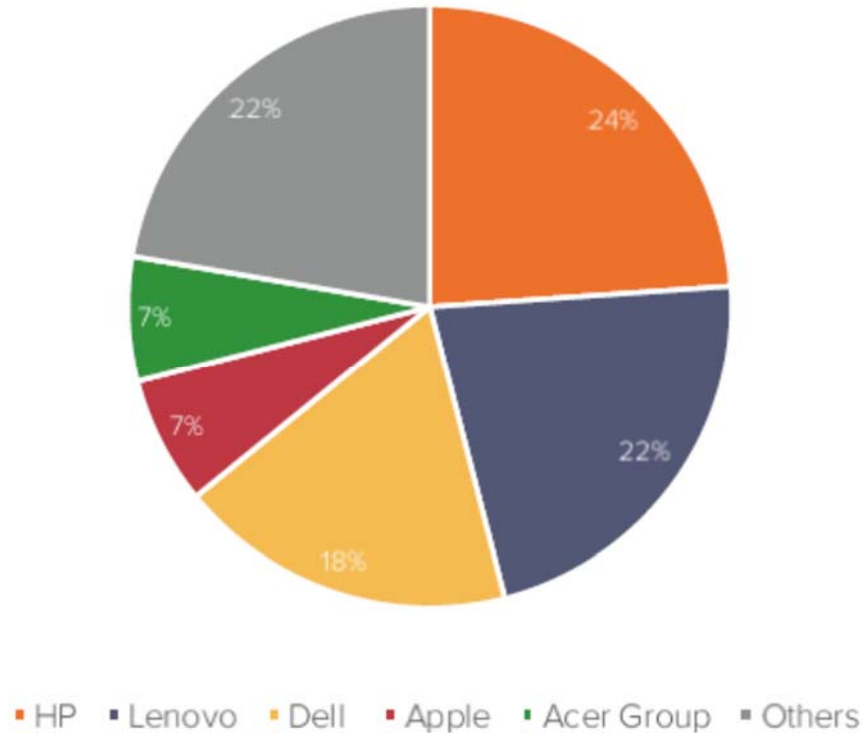
15 105. In January 2018, an online website put together a detailed analysis of the marked rise
 16 in computer memory product prices from 2016 to 2018. For three sample products, the website
 17 estimated price increases of 80-175% since the date of purchase. The website stated that for one
 18 example, “we plotted a *monthly* price appreciation of \$2.25, month-over-month, between May, 2016
 19 and today. That’s better percent gains than many stocks; you could have purchased a truckload of
 20 memory at the dip in 2015/2016, then sold it for 2-4x the price *after* using it in a system.”¹⁶
 21

22 106. The markets for the manufacture (by OEMs) and sale of the DRAM Devices at issue
 23 in this case are concentrated, and the manufacturers and retailers who sell DRAM Devices are easily
 24
 25
 26

27 ¹⁶ Patrick Lathan, *RAM Price Report: DDR4 Same Price as Initial Launch*, Gamers Nexus (Jan.
 28 22, 2018), <https://www.gamersnexus.net/industry/3212-ram-price-investigation-ddr4-same-price-as-initial-launch> (emphasis in original) (last visited Apr. 29, 2021).

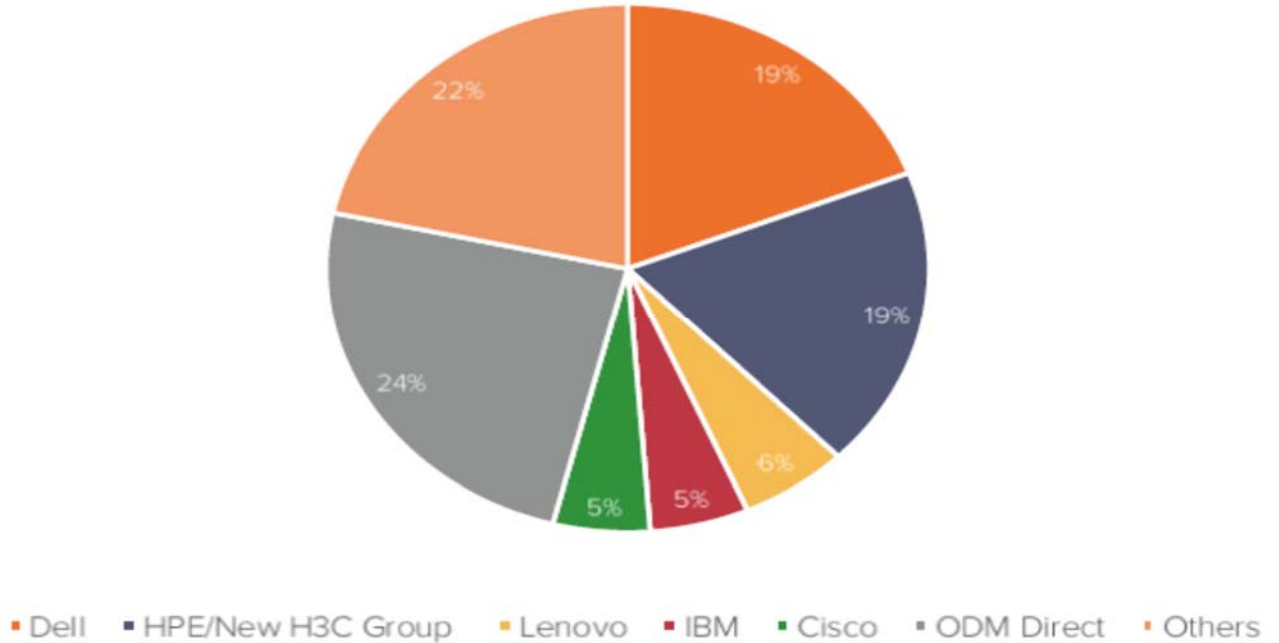
identifiable. For example, the top five personal computer manufacturers accounted for approximately 77% of the world shipments as of the second quarter of 2018.

Market Share (PC Shipments) Q2 2018



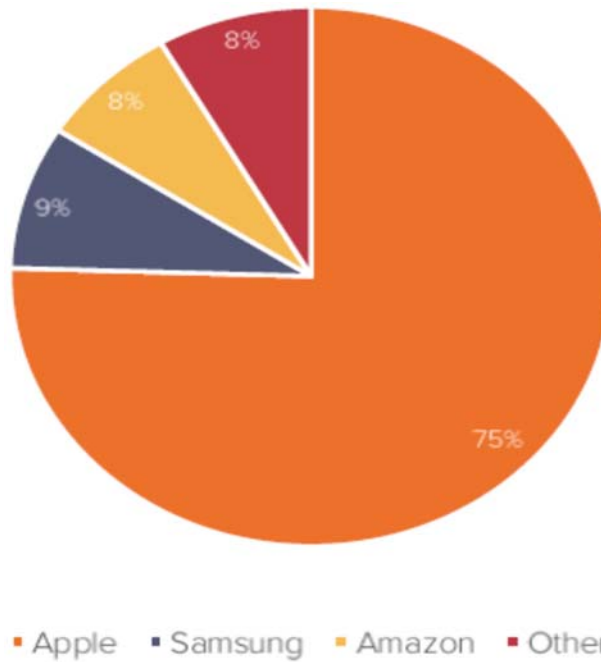
107. Similarly concentrated is the market for network servers. The top five network server vendors accounted for approximately 78% of the revenues generated by networks servers as of the first quarter of 2018.

Market Share (Server Vendor Revenue) Q1 2018



108. The tablet market is even more concentrated. The top three tablet manufacturers accounted for more than 90% of the market revenues as of the third quarter of 2018.¹⁷

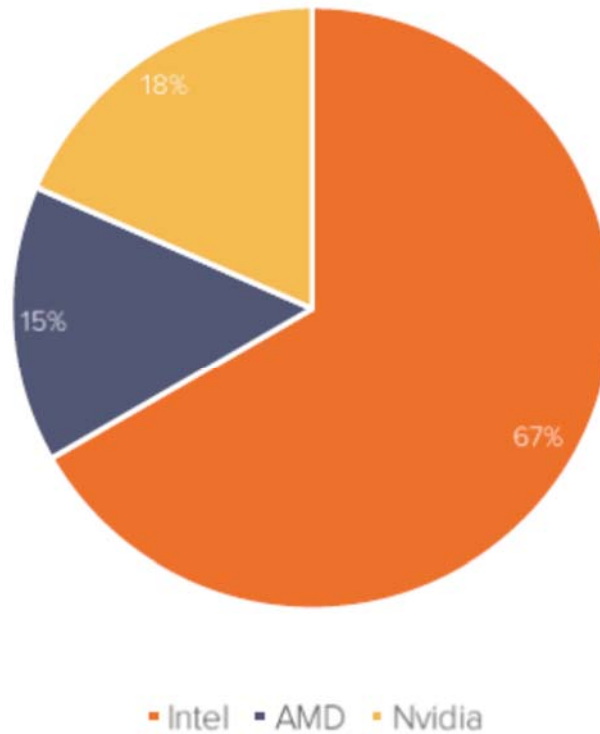
¹⁷ *Tablet Vendor Market Share US*, StatCounter, <https://gs.statcounter.com/vendor-market-share/tablet/US> (last visited April 22, 2021).

US Market Share for Tablets Q3 2018

109. Just three graphical processing unit manufacturers count for the entire market, measured in terms of revenue. That is shown below, using the underlying data from the first quarter of 2018, as a representative exemplar.¹⁸

¹⁸ Joel Hruska, *Charting 9 Years of GPU Market Shifts Between Intel, AMD, and Nvidia*, Extreme Tech (Sept. 5, 2018), <https://www.extremetech.com/gaming/276425-charting-9-years-of-gpu-market-shifts-between-intel-amd-and-nvidia> (last visited Apr. 29, 2021).

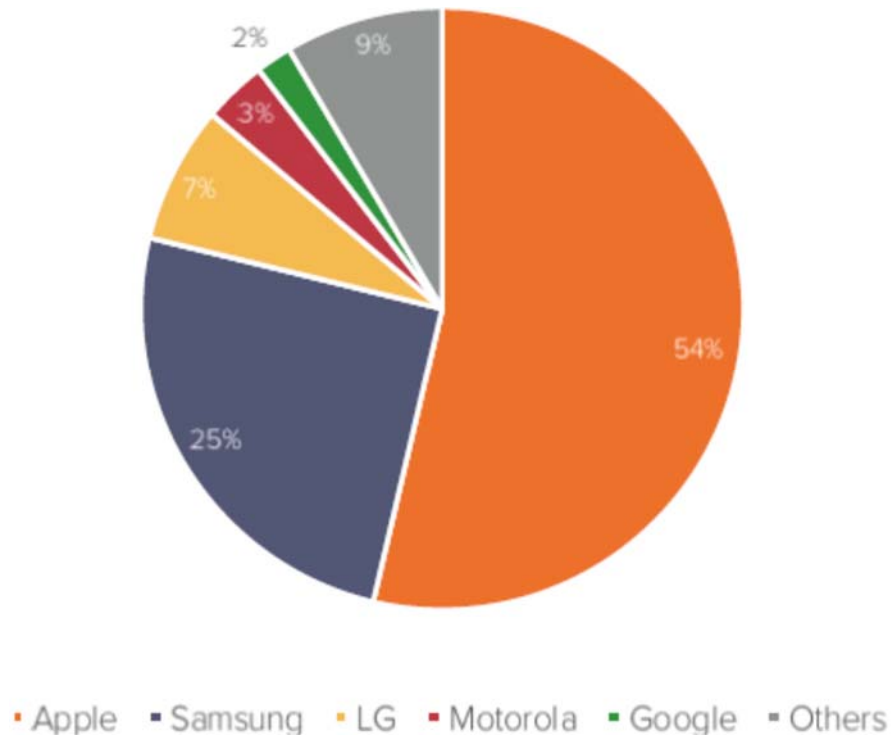
Market Share for GPU Manufacturing Q1 2018



110. With regard to cellular phones, Apple, Samsung, LG, Motorola, and Google accounted for more than 90% of the cell phone revenues as of the third quarter of 2018.¹⁹

¹⁹ *Mobile Vendor Market Share United States of America*, StatCounter, <https://gs.statcounter.com/vendor-market-share/mobile/united-states-of-america> (last visited Apr. 22, 2021).

US Market Share of Cell Phone Vendors Q3 2018



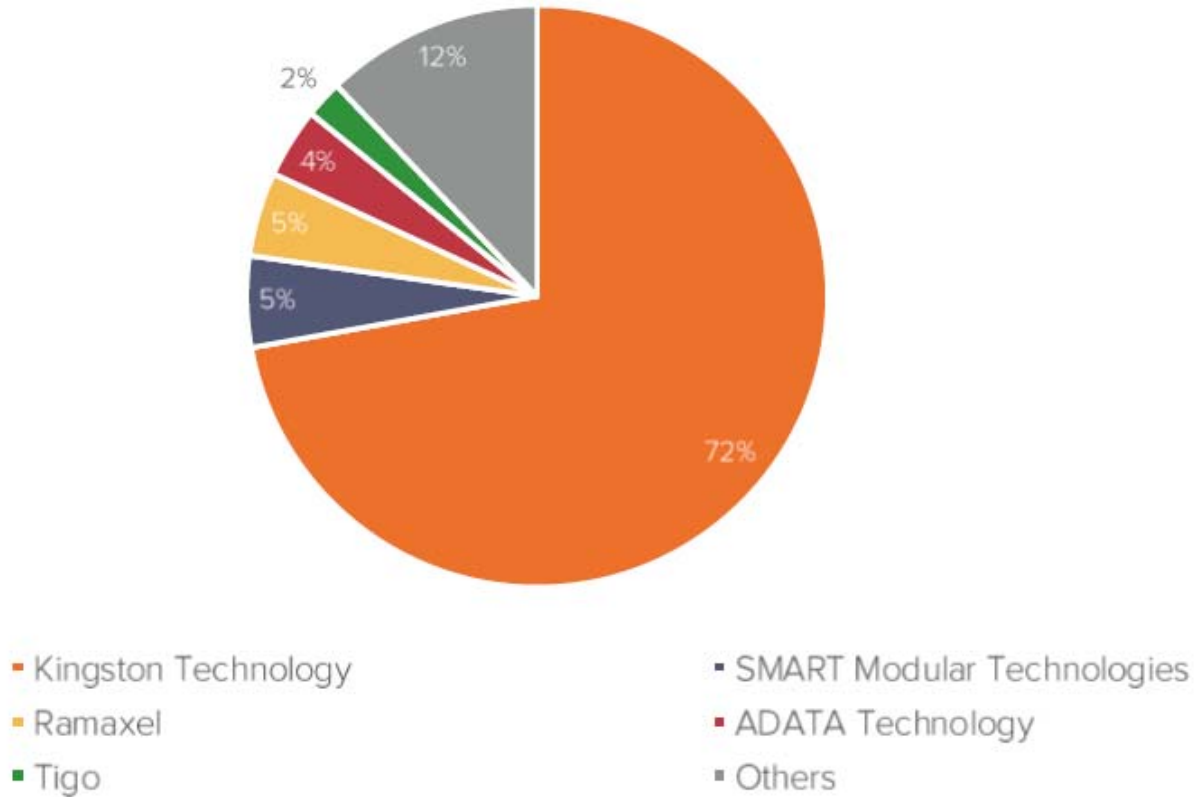
111.

112. The market for DRAM module manufacturing, for “memory sticks,” is similarly concentrated. The top five module manufacturers account for close to 90% of the market, in terms of revenue as of 2018.²⁰

²⁰ *Top Ten DRAM Module Suppliers by Revenue, Which Grew by Over 40% YoY in 2018, Says TrendForce*, TrendForce (Aug. 21, 2019), <https://press.trendforce.com/press/20190821-3287.html> (last visited Apr. 22, 2021).

DRAM Module Manufacturers' Market Share 2018

DRAM Module Manufacturers' Market Share 2018



113. Finally, the market for consumer electronics retailers, who sell DRAM Devices to consumers, is also concentrated, with the market participants easily identifiable. For example, the top ten retailers have accounted for approximately 80% of the revenues in the specified category, when including Apple, Dell, HP, and Lenovo, which commonly sell directly to consumers. The other top 10 retailers on this list are Amazon, Best Buy, Walmart, GameStop, CDW, and Target.²¹

²¹ See Daphne Howland, *Amazon Beats Best Buy as Top Electronics Retailer* (DealersScope : Top 101 Retailers for 2018, Consumer Electronics or “CE” Sales Estimates), Retail Dive (Apr. 17, 2018); <https://www.retaildive.com/news/amazon-beats-best-buy-as-top-electronics-retailer/521505/> (last visited Apr. 29, 2021).

**V. DEFENDANTS CONSPIRED TO RESTRAIN
COMPETITION FOR SALES OF DRAM**

A. Prior to the Start of the Class Period, Defendants Made Independent Supply and Capacity Decisions, Leading to Declining DRAM Prices

1. Between August 2014 and the end of 2015, competition between Defendants caused DRAM prices to decline

114. Between May 2014 and August 2014, the average spot price for DRAM ranged between \$2.50 and \$2.70 per chip.

115. Between August 2014 and the end of 2015 (just prior to the start of the Class Period on June 1, 2016), the three Defendants, who are responsible for nearly all DRAM supply, competed by, among other things, seeking to increase their own market share at the expense of their competitors. This competition led to supply exceeding demand, which caused declining DRAM prices. This price competition gave Defendants a strong motive to collude.

116. For example, between May 2014 and August 2014, average spot prices for DRAM were between \$2.50 and \$2.70 per chip. Those prices went down month-by-month, and, by May 2016, average DRAM spot prices had fallen to approximately \$1.00 per chip.

117. Between August 2014 and May 2016, prices for the most common types of DRAM – DDR3 and DDR4 – all declined steadily and precipitously. Average spot prices for DRAM from August 2014 to May 2016 declined by more than 57%. For example, from October 2014 to June 2016, the average contact price of DDR3 4GB went down 62%, from \$32.75 to \$12.50.

2. Defendants' Supply and Pricing behavior changed abruptly and nearly simultaneously at the beginning of the Class Period

118. Prior to the start of the class period, Defendants appeared to engage in vigorous supply and price competition. For example, on July 31, 2014, Samsung, on its 2014 Q2 earnings call, emphasized that it would be able to grow supply faster than that of the other Defendants and that this represented an opportunity for Samsung to capture market share: "our bit growth in second quarter was approximately 20% q-on-q and we expect for the third quarter the market DRAM bit growth will

1 come in at high single digit[s] and we will outgrow the market's bit growth. At this point we expect
2 the DRAM market bit growth for 2014 to be low 30%s and we expect our bit growth for the year to
3 be high 40%s . . . so while the market demand remains strong, the suppliers weren't able to bring on
4 additional supply much more other than us, and therefore we were in a very good position to capture
5 this opportunity.”

6
7 119. On October 30, 2014, Samsung, on its third quarter 2014 earnings call, announced
8 that its policy in 2015 was grow supply faster than that of its competitors: “But our basic policy is
9 that our bit growth rate next year should or would have to be higher than the industry. That is our
10 goal.”

11 120. On January 29, 2015, Samsung, on its fourth quarter 2014 earnings call, assured
12 investors that it could grow supply quickly and take market share from its competitors: “We are
13 expecting about mid 20% bit growth for market growth for DRAM and our bit growth we believe
14 will outgrow that of the market growth.” Samsung also said it had the capacity to increase production
15 and would increase production if it saw shortages or increasing demand: “a shortage in the industry
16 would be great news . . . we will have signs to indicate a shortage coming forward, and so if we do
17 see such signs such as the economy picking up or orders for other components picking up, I think
18 that we will find a way of capturing any shortage opportunities if they do materialize.” Samsung
19 emphasized that it intended to continue to outgrow the industry: “so the main reason why we are
20 planning and expecting to outgrow the industry is because we have better productivity compared to
21 our competitors based on our technology leadership in terms of the manufacturing. That is the main
22 reason why we're expecting to outgrow the industry.”

23
24
25 121. Throughout 2015, Samsung repeatedly told the industry it was sticking to its plan of
26 outgrowing the market. On October 29, 2015, Samsung, on its 2015 Q3 earnings call, reported that it
27
28

1 had successfully executed its plans of outgrowing the market: “And for 2015 DRAM, we expect the
2 market growth to be low to mid 20% and our bit growth for the year will low 30%.”

3 **a. Samsung tried on its own to limit supply and raise prices and when that**
4 **failed, it attempted to secretly communicate its intention to raise prices to**
5 **the other Defendants to spur joint action.**

6 122. As discussed at length in Part I, *supra*, the Overview of the Conspiracy, CW 1
7 explains that at the end of 2015, Samsung, concerned by the continuing slide of DRAM prices,
8 decided that it would attempt to go it alone and stockpile wafers, which Samsung hoped would stop
9 DRAM price erosion and raise prices. However, that unilateral effort failed.

10 123. Thus, CW 1 explains, in the beginning of 2016, Sewon Chun, a Korean Samsung
11 executive with pricing responsibilities, instructed U.S.-based Samsung executive Pablo Temprano to
12 intentionally leak to industry analyst Sean Muir that Samsung was raising prices on DRAM. CW 1
13 understood that the Samsung’s purpose was to have Mr. Muir, who published a widely-respected
14 monthly report on DRAM prices subscribed to by industry participants, publish information about
15 Samsung’s intention to raise prices so that its competitors (co-Defendants) knew that Samsung was
16 raising DRAM prices. CW 1 understood that Micron and Hynix would not raise prices unless they
17 knew that Samsung was raising prices. CW 1 also understood that this signaling was essential for
18 conveying the information to Micron and Hynix because it would not be in the interest of purchasers
19 of DRAM to tell Micron and Hynix that Samsung was raising DRAM prices. Thus, coordinated
20 action by the Defendants was the only way that DRAM prices would rise, which is exactly what
21 occurred.
22

23 **b. In 2015, the Defendants grew supply at the same rate as their forecasted**
24 **growth in demand, but starting in 2016 Defendants intentionally**
25 **restricted supply so that it grew slower than demand.**

26 124. On September 8, 2015, Ernie Maddock, Micron’s CFO, said at the Citi Global
27 Technology Conference, that DRAM supply and demand would both grow in the mid 20% range for
28 2016: “*we continue to see supply and demand in the DRAM space in relative balance of aggregate*

1 *bit growth in sort of that mid-20% range as we look at 2016. . .*” Micron reiterated “the way we are
2 thinking about ’16 as I mentioned earlier in DRAM is sort of 20% to 30% bit growth by the industry
3 and similar increase in demand.”

4 125. On December 1, 2015, Micron’s CFO, Ernie Maddock said at the Credit Suisse
5 Technology, Media & Telecom Brokers Conference that supply and demand would be balanced in
6 2016: “if you look at the DRAM front based upon what we’ve talked about and the public
7 announcement of our competitors it feels very much like folks are focused on technology transition
8 that has a relatively predictable outcome in terms of bit[s] supplied and as we look at bits demanded
9 which we think for DRAM next year are kind of in the mid-20s, it doesn’t appear as if there is going
10 to be a significant imbalance there.”

11
12 126. By contrast, Micron repeatedly forecast supply growing slower than demand from the
13 end of 2016 throughout 2017. On December 7, 2016 at the Barclays Technology Conference,
14 Micron’s CFO, Ernie Maddock, forecast supply growing slower than demand: “So as we look at the
15 supply side of the house, somewhat between 15% and 20% supply growth coming from these
16 technology transitions and that is against a demand environment that we think is going to grow
17 somewhere in the range of 20% to 25% on a bip basis.”

18
19 127. On March 9, 2017, at the Susquehanna Semi, Storage, & Technology Conference, Mr.
20 Maddock again reiterated the same forecast: “15% to 20% bit growth in supply and 20%, 25% sort of
21 intrinsic demand growth.” And again, on August 7, 2017, Micron’s CEO, Sanjay Mehrotra, at the
22 KeyBanc Capital Markets Annual Global Technology Leadership Forum Conference reaffirmed the
23 same gap between supply and demand and expressly noted the effect on industry fundamentals of
24 this imbalance: “overall bit supply in the industry is in 15% to 20% range. And when you look at the
25 bit supply growth perhaps, may be little bit toward the higher end of that 15% to 20% range. But, the
26 demand projection, again, from all the mega markets that I earlier talked about, point to greater than
27
28

20% demand for the industry. So, I do believe that for 2017 and heading into 2018 as well, the industry fundamentals will be healthy.”

128. As described more fully below, Defendants’ conduct changed at the beginning of the Class Period. Through unlawful coordination, Defendants restrained DRAM supply growth by agreeing to and in fact not adding new wafers, ensuring that DRAM prices rapidly rose as DRAM demand exceeded supply.

B. The Class Period Begins No Later than June 1, 2016, as Defendants’ Efforts to Coordinate to Ensure Capacity Discipline and DRAM Price Increases That Started in Early 2016 Began to Bear Fruit

1. From early 2016, Defendants engaged in concerted signaling to each other through public statements and actions in response that effectuated an agreement between Defendants to artificially restrict supply growth of DRAM – causing DRAM prices to skyrocket.

129. During the Class Period, Defendants agreed to delay or slow capacity growth, or not to expand capacity. This enabled Defendants to stop DRAM prices from falling and, in fact, caused prices to dramatically reverse course and skyrocket. One method Defendants used to effectuate their agreement was to communicate their shared intentions to limit DRAM capacity through public statements, and to each take actions in response.

130. Defendants made statements in earnings calls, press releases, media, or other public documents and monitored each other’s plans.

131. Defendants’ statements about capacity discipline, limiting production or supply, not increasing supply/capacity, slowing growth in capacity or supply, etc. represented a deviation from past business practices and included statements about a Defendant’s own business, about what the industry as a whole was doing, had done, or should do, and what competitors (i.e., the other Defendants) were saying, doing, or should do.

132. By reassuring each other through these communications, Defendants demonstrated each was committed to maintaining capacity and supply discipline in the midst of steady demand and

1 rising prices – unlike in 2014, and contrary to each individual’s interest to increase market share and
2 short-term profits. As a result, Defendants reaped huge profits during the Class Period.

3 133. In fact, Defendants’ conduct was highly indicative of conspiracy, including by taking
4 actions against self-interest that would have been irrational in the absence of a conspiracy. But these
5 conspiratorial actions were tremendously effective in causing DRAM prices to skyrocket from the
6 middle of 2016 to the end of 2017. During this period of time, ***DRAM spot prices rose nearly 350%***
7 – an increase totally unique compared to DRAM’s prior pricing history.

9 **2. Defendants’ public statements.**

10 134. Defendants’ public coordination efforts began at the end of 2015 and steadily
11 increased throughout the first half of 2016. In particular, Micron made public invitations for its
12 competitors to stop adding wafer capacity and then to cut supply. Samsung, in response, and
13 consistent with the company’s objectives at that time as understood by CW 1, stopped its prior
14 efforts to aggressively take market share through additions of wafer capacity. Hynix also cut wafer
15 capacity in response to Microns invitation. The actions of Defendants were effective in causing
16 DRAM prices to first stabilize and then start to rapidly increase throughout 2016.

17 135. On November 17, 2015, Micron’s CFO, Ernie Maddock, at the UBS Global
18 Technology Conference, emphasized to investors that the DRAM industry was characterized by high
19 market concentration with significant barriers to entry: “we do believe that from a market
20 perspective, we’re in an environment where you have closely held technology by a very limited
21 number of producers. Micron forecast that its competitors would make some “really rational
22 decisions” involving “lower supply growth” and no “significant DRAM capacity expansion.”
23

24 136. Samsung responded to Micron’s invitation to restrict supply growth on January 29,
25 2016, on its fourth quarter 2015 earnings call, stating that in 2016 “we will be able to grow our
26 supply, we’re planning, at market growth levels. ***This year our main focus will be on profitability***
27
28

1 *rather than increasing volume.*” Samsung’s 2016 plan was a change from its actions in 2015 where
2 it had grown supply in an effort to take market share from competitors.

3 137. Micron then went further and actively encouraged the other Defendants to cut
4 production, while assuring them that Micron would not use a production cut as an excuse to take
5 market share. On March 7, 2016, Micron’s CFO, Ernie Maddock, reassured investors at the
6 Raymond James Institutional Investors Conference that Micron’s competitors were now not
7 competing for market share and were instead focused on profitability: “So the question was that there
8 are Taiwan or Korean entities bidding for share i.e. causing our pricing environment to be different
9 than it otherwise would be. You know, honestly we’re not seeing that. . . . So obviously if you have
10 folks look to the Koreans and if you actually look at some of the public commentary they have made
11 with respect to the business environment they see, the focus on profitability and *as we look at market*
12 *behavior it is not consistent with any sort of deliberate attempt to take share*, but so that’s what we
13 are seeing.”
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16 138. On March 30, 2016, Micron’s CEO, Mark Durcan, at the second quarter of 2016
17 earnings call, in response to investor analyst questions about potential supply cuts, publicly stated
18 that Micron would be willing to cut supply if its competitors also cut supply: “Q: Pricing is going to
19 continue to be weak until Micron and the DRAM industry overall cuts production. So, I guess, my
20 question is, what will it take for that to happen? A: We don’t have any plans that cut production to
21 date. *Q: I mean is your point that it’s got to come from the market share leader first? A: . . . we*
22 *think we’d be foolish to be the first ones to take capacity off.*” Micron’s CFO further confirmed that
23 Micron would not unilaterally cut production: “*it’s a really ill-advised move to be unilaterally*
24 *cutting production.*” On the same call, Mr. Durcan emphasized that Micron would not try to take
25 market share from its competitors: “*Our focus isn’t on market share.* Our focus is on making sure
26 that we’ve deployed at least equivalent advanced technology to our competitors, so that we’re not
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1 incentivizing others to play for market share.” Micron’s statements were an invitation to Samsung
2 and Hynix to cut production with a reassurance that Micron would not try to take market share in
3 response to such a cut. And, in fact, both Samsung and Hynix responded to Micron’s invitation to cut
4 production within one month.

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6 139. Samsung, within a month, publicly responded to Micron’s invitation to cut production
7 on its April 28, 2016 quarterly earnings call, stating that its *bit growth was negative* for the quarter.
8 Samsung confirmed to an analyst that it was constraining supply increases and would grow at the
9 same rate as competitors: “Q: It seems you have been continuously reducing your investments on the
10 DRAM side. Could you provide your company’s outlook on the DRAM growth for this year? A: We
11 don’t expect there to be major increases in supply of DRAM in the near future . . . in terms of full
12 year 2016 DRAM shipment we expect to be in line with the market growth.” Samsung’s actions
13 were in line with what CW 1 understood to be the reason that Mr. Temprano was told to leak
14 Samsung’s pricing plans – to ensure that Samsung’s competitors would know what it plans were so
15 that they would take consistent actions. That objective is reflected in Samsung’s actions and
16 statements throughout the remainder of the conspiracy period.

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18 140. Hynix also responded to Micron’s invitation to cut production within a month of
19 Micron’s statement. On April 27, 2016, a Deutsche Bank report on Hynix stated that “Although no
20 specific guidance was provided, management toned down its capex expectations for 2016, especially
21 for DRAM. SK Hynix expects its total capex to be down [year over year] in 2016, with some capex
22 allocated to R&D purposes and not for capacity improvement.” On the same date, an analyst report
23 by NH Investment & Securities stated that “in order to protect DRAM prices—major DRAM players
24 are reluctant to conduct related investment at this juncture, a development which should enhance
25 industry conditions.”
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1 141. On May 25, 2016, Micron's CEO, Mark Durcan, recognized that "there has been
2 some relatively encouraging news that has been disseminated via various channels and from the
3 competitors about, we are [seeing] capital spending going into next year, particularly for DRAM. I
4 think we have to just wait and see how that plays out. But my expectation, as I sit here today, is that
5 as long as nobody adds any incremental DRAM wafers, which I think is unlikely that anyone would
6 do that, given the ROI on incremental wafers, then that growth next year will be 20%-ish. And we
7 think that that will be slightly less than demand, so we think it should drive stabilization." Durcan
8 continued that "[i]f wafers actually come down as we're starting to hear some equipment suppliers
9 talk about, then it could be mid- to high-teens, in which case that would be more beneficial." Micron
10 explained that there are only three suppliers in the market, and "*we all are going to either benefit or*
11 *be hurt by excess supply in the marketplace.*" Micron's CEO stated that he expected "slowing bit
12 growth" in the industry and that he expected Micron and its competitors to maintain supply
13 discipline: "there's a natural tightening tendency absent, somebody wanting to do something different
14 than that. And so I'm – I actually remain bullish on the long term value, the DRAM business and the
15 actions of the competitors in the marketplace."
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18 142. That same month, in May 2016, with demand remaining steady, DRAM prices began
19 to accelerate upward rapidly.
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21 143. On June 1, 2016, a Deutsche Bank report stated that "We are encouraged that both
22 Samsung and SK Hynix confirmed that their DRAM capex will decline y/y . . . while emphasizing
23 the importance of profitability."
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25 144. On June 16, 2016, Micron's CFO, Ernie Maddock, reassured investors at the Nasdaq
26 Investors Program Conference that he expected Samsung to not disrupt the industry consensus of
27 constraining supply growth: "Q: The number of players in DRAM has gone down to three today as
28 you mentioned, *how concerned are you that in this new environment Samsung continues to be*

1 *disruptive*. . . A: at least thus far many of the public comments that have been made, a lot of which
2 have been made by the equipment companies collaborate *this idea that there is a general reduction*
3 *in DRAM CapEx planned by our Korean competitors and that we believe is very consistent with*
4 *other messages that we're hearing in the marketplace*. So am I concerned? We're always
5 concerned. Do we believe that that disruptive behavior is a high likelihood? It just doesn't feel as if
6 that's the case right now."

8 145. *From that month in June 2016, and through the end of 2016, DRAM prices*
9 *increased by 50 percent*. Yet, unexpectedly absent coordination, during this timeframe *each*
10 *Defendants kept supply bit growth restrained by avoiding adding significant wafer capacity*. At the
11 same time, industry participants, led by Micron, began to coordinate for 2017 on a plan of keeping
12 *supply bit growth below forecasted demand growth*.

13 146. On a July 21, 2016 second quarter earnings call, a representative from SK Hynix's
14 Management team stated that its bit growth for the year would be in the low to mid 20 percent range,
15 in line with market growth. Seven days later, on July 28, 2016, Samsung stated a very similar range
16 for bit growth in 2016 on its quarterly earnings call, and that its plans were flexible depending on
17 market conditions.

18 147. On September 8, 2016, Micron executives at the Citi Global Technology Conference
19 reaffirmed the industry consensus for DRAM bit growth as somewhere under 20 percent (perhaps
20 even 15%), which they described as "good" and a "really nice environment." Micron emphasized
21 that neither Micron nor its competitors were adding wafers that would increase available supply,
22 with Micron's CFO reiterating public signals from Samsung and Hynix that they, like Micron, were
23 not adding wafer capacity: "while I would love to tell you that our competitors have sent us a memo
24 telling us what their expansion plans are, unfortunately I can't report that, but certainly we read the
25 same thing that each of you read and it does suggest that the focus of capital spend in 2017 is going
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1 to be NAND as opposed to DRAM on the part of many folks in the competitors face. And as I
2 mentioned, *we would expect all of our bit growth to come from technology transition as opposed to*
3 *any sort of wafer expansion.* There have been some pretty dramatic things published which I won't
4 repeat here relative to potentially what's going on with some of our competitors and how they're
5 choosing to use their productive capacity, *but there's no sign anywhere in the market that suggests*
6 *there's a plan to expand DRAM wafer capacity.*" Micron's CFO strongly reassured investors that
7 Micron had no plans to increase supply despite increasing demand: "Q: And it doesn't look like you
8 guys are changing the supply side from Micron at all with the better demand, right? A: *Well, I mean*
9 *we have basically announced what we intend to do in terms of bit growth and we're sticking to*
10 *that.* And so it would have to be a very, very significant and profound belief that something had
11 materially changed in the demand environment, I think, to cause us to reassess that CapEx plan in
12 any significant way."

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15 148. On an October 4, 2016 fourth quarter earnings call, Micron reaffirmed the industry
16 plan of keeping supply growth between 15-20% through minimal additions of wafers – even as
17 demand growth was forecast between 20-25%. Micron's CEO, Mark Durcan, stated that "we've seen
18 further evidence that DRAM wafer output is declining as a result of lost throughput related to the 20-
19 nanometer and 1X nanometer conversions. Absent some replacement of these wafers, we could see
20 industry supply growth as low as mid-teens in 2017. As some of lost wafer output is replaced,
21 industry supply growth could be in the high-teens percent range. This compares to our long-term bit
22 demand growth forecast in the low to mid 20% range."

23
24 149. On an October 27, 2016 quarterly earnings call, Samsung affirmed Micron's public
25 assessment of the market, aligning its own statements regarding supply and capacity plans in 2017
26 with Micron: "given the fact that we haven't done much investments in DRAM this year, we are
27 expecting our growth rates to come down, and be in line with market bit growth in DRAM next
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1 year.” Samsung reassured investors that it would not try to compete with its competitors by taking
2 market share: “Once again, as we have always mentioned, regarding DRAM, our focus is not to
3 increase our market share but to maximize our profits. And so our investments as well as production
4 will also be flexibly managed according to how the market unfolds.”

5
6 150. Industry analysts observed the capacity discipline of the Defendants that was leading
7 to rising prices and profits. On November 28, 2016, a Deutsche Bank report stated that “our research
8 suggests DRAM suppliers are reluctant to add new capacity despite surging profits.”

9 151. As DRAM prices continued to rocket upward through the end 2016 and into the
10 beginning of 2017, Defendants continued to not only make public statements about their own
11 commitment to capacity and supply discipline, ***but also the importance of maintaining capacity and***
12 ***supply discipline within the industry as a whole***, affirming their commitment to a common scheme
13 to limit supply and capacity to drive up prices.

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15 152. On November 29, 2016 Micron’s CFO at the Credit Suisse Technology Media &
16 Telecom Conference reaffirmed the commitment of the entire DRAM industry to maintaining supply
17 growth below 20% even as demand growth exceeded 20%: “I think a lot of that confidence goes
18 back to the fundamental view of this supply and this demand. With no way for additions, ***we [think]***
19 ***that you are going to see this supply grow at something less than 20%, and even with some room***
20 ***for error on the DRAM with demand side, we still see a number there north of 20%.***” Micron was
21 confident that the “industry will do pretty well . . . until we see announcements of new wafers.” Like
22 Samsung, Micron reassured investors that it would not add supply in an attempt to compete for
23 market share with competitors: ***“our objective is to close the gap [with our competitors] and make it***
24 ***as narrow as reasonable without doing anything that would potentially be disruptive to our***
25 ***performance or the industry’s performance.***”
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1 153. On December 7, 2016, Micron's CFO, Ernie Maddock, explicitly stated at the
2 Barclays Technology Conference that the absence of wafer capacity additions would allow the
3 Defendants to easily maintain supply growth at 15-20% even as demand grew 20-25%: "we continue
4 to look at the longer term supply demand trends and *in the absence of wafer additions by Micron or*
5 *one of the other industry participants*, we continue to see those as healthy because the technology
6 transitions that we're going through yield progressively fewer incremental [bit]. So *as we look at the*
7 *supply side of the house, somewhat between 15% and 20% supply growth coming from these*
8 *technology transitions and that is against a demand environment that we think is going to grow*
9 *somewhere in the range of 20% to 25% on a [bit] basis."*

11 154. On a December 21, 2016 earnings call for Micron's fourth quarter 2016 results,
12 Micron CEO Mark Durcan reassured investors that Samsung had learned from its miscalculation in
13 2014 of adding supply capacity to meet strong demand and pricing, which was similar to the current
14 situation facing the industry: "*Q: [Do] you have any comments on what is different between the*
15 *previous cycle? A: Well I think that part of what happened in the last latter stages of the last cycle*
16 *where perhaps a little bit a miscalculation by one of the suppliers, but that they probably learned*
17 *from so there is that."* Despite rapidly rising prices, Durcan stated that Micron "had no plans to add
18 new wafers this year" even though it had "some clean room space" that would allow it to add wafers.
19 Micron's CEO also confirmed that it was closely monitoring competitors, including through the
20 collection of "internal intelligence" and expected that the industry would maintain its consensus of
21 15-20% supply growth without significant additions of wafers: "Q: you had mentioned around 15%
22 to 20% bit supply growth in DRAM barring any additional supply from competitors. Can you talk a
23 little bit about the -- what you're seeing in terms of the transition to 80 nanometer for some of your
24 competitors? *And is there risk in your mind in terms of additional supply coming online, any*
25 *thoughts on that would be helpful.* A: We don't have great crystal ball as to where our competitors
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1 are doing. *We read the same reports that you guys read. All of that plus all the other internal*
 2 *intelligence we can generate that baked into our ranges and in the data sheet that we provided. So*
 3 *I think there has been some chatter recently potentially about few incremental wafers from one of*
 4 *the suppliers. Our view of that is if that were to happen, it's a relatively minor adjustment in terms*
 5 *of the overall scope of the bit growth that we're projecting and it would probably not cause us to*
 6 *change that range that we've giving you."*

8 155. On January 10, 2017, at the Needham Growth Conference, Micron's CFO, Ernie
 9 Maddock, further communicated Micron's confidence that Samsung would not deviate from the
 10 industry consensus of restricting supply to ensure it grew slower than demand growth: "Q: Can you
 11 talk about [Samsung] and how rational. . . ? A: . . . I think their comments need to stand on their
 12 own *and their comment seems to suggest a rational approach to addressing the supply/demand*
 13 *constraints of the DRAM market . . . the world is very different today than it was a few years ago."*
 14 Maddock again reiterated the shared plan of the industry to maintain 15-20% supply growth even as
 15 demand grew between 20-25%: "Our review of the DRAM business is *that there will be somewhere*
 16 *between 15% and 20% bit supply from Micron and all the other participants in the industry . . . we*
 17 *think demand is going to be . . . somewhere between 20% and 25%."*

19 156. On January 24, 2017, Samsung reassured investors on its quarterly earnings call that it
 20 had no plans to add wafer capacity and would continue to constrain increases in DRAM supply
 21 despite rapidly rising prices: "Q: Looking at your bit growth for 2016 and guidance for 2017,
 22 considering supply/demand is so strong and profitability getting for DRAM back to, I think, all-time
 23 high-levels this year, *I'm a little bit surprised that Samsung is not looking to be a little bit more*
 24 *aggressive towards the capacity additions. . . .* If demand continues to be so strong and
 25 supply/demand balance remaining tight, *is there some possibility that Samsung can actually boost*
 26 *capacity through the year and potentially beat those numbers, just like you did in 2016? A: And*
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1 *looking at the current market situation, we believe that we are able to cover the current market*
 2 *demand through our technology migration. So that is why we will be maintaining our operation*
 3 *flexibly and try to cover the market demand within our technology migration. So, given the size as*
 4 *well as the lead time necessary for increase of DRAM capacity, we believe that temporary increase*
 5 *of DRAM supply is not very easy. And therefore, in a tight supply and demand situation, we will*
 6 *focus our product mix on the higher profitability products and to respond flexibly for our*
 7 *customers' demand."*

9 157. On a January 25, 2017, *SK Hynix publicly matched the stated plans of its*
 10 *competitors* – keeping supply growth below demand growth while not trying to take market share.
 11 Specifically, SK Hynix executives stated that the company “believe[s] that throughout the first half
 12 of the year supply is not going to meet the demand which remains very strong” and that “the
 13 company is planning for a DRAM bit shipment growth that is on par with the market for this year.”
 14 This course of action would allow SK Hynix to “maximize profitability.” Hynix emphasized that
 15 “DRAM chip supply growth may not keep up with demand.”
 16

17 158. Industry analysts from Sanford Bernstein noted the refusal of the Defendant-
 18 competitors to increase supply, with multiple analyst reports on SK Hynix in January 2017
 19 identifying, for example, that there is “tighter than expected supply/demand balance for the quarter,”
 20 and that given this “we expect this strong pricing environment (especially in DRAM) through mid-
 21 2017 at least, as inventory levels are low and supply growth remains relatively muted in both DRAM
 22 and NAND. . . . With all players growing bits relatively modestly, we don’t see any pricing
 23 collapse.” Goldman Sachs also forecast on January 30, 2017 that DRAM pricing would “increase
 24 further in 1H17, driven by a tight supply/demand balance,” and that Goldman believed that “the
 25 leading DRAM maker, Samsung Electronics (SEC) [would] not become aggressive to gain market
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1 share in 2017 given that: (1) SEC’s management is likely to focus more on profitability rather than
2 market share in DRAM due to structural margin pressure on its smartphone business.”

3 159. As prices and margins continued to accelerate among Defendants upward, and
4 questioners concernedly pointed out “[i]n the past, every time margins have expanded . . . among all
5 the industry participants [t]here has been increased capacity,” Micron’s CFO strongly reiterated on
6 March 9, 2017 at a Susquehanna Semi, Storage & Technology Conference Call, that Micron had
7 been “public about the fact that we have no current plan to add [DRAM] wafers in any form” and
8 would not be attempting to increase its market share. The CFO’s statement was an overt public
9 communication to its competitors about its supply plans and that it would not disrupt the positive
10 supply and pricing environment. Micron also stated that its competitors were in agreement that they
11 would not add capacity in an effort to take market share from each other: “But at the end of the day,
12 it has typically not been Micron who has expanded industry capacity when the margin profile
13 upgrade . . . *all of the statements and all of the actions thus far suggest the things may indeed be*
14 *different in terms of how the participants are thinking about, the balance of profitability versus*
15 *market share.*” Micron also stated that its plans would “provide maximum benefit to the Company.”

16 160. On March 23, 2017, Micron’s CEO, Mark Durcan, reiterated on the second quarter
17 2017 earnings call that Micron and its competitors, in contrast to previous cycles, were continuing to
18 constrain supply growth in the face of healthy demand: “We also see that the supply, as best we can
19 tell, seems in control relative to demand. And I think, if you think about this cycle versus last cycle,
20 what you saw -- what you saw last cycle was a big chunk of supply come off with the Hynix fire and
21 the reaction with more supply to replace it and so maybe a little less stability than we’re seeing this
22 time around.” Durcan also reassured investors that Samsung’s behavior had changed from previous
23 cycles, and that there was no reason for Samsung to lower the industry’s profitability by adding
24 wafer capacity, which he termed a “mistake” that he did not believe Samsung “would intentionally
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1 repeat”: *“Q: . . . People are obviously worried about Samsung adding a bunch of wafers. Why*
 2 *would that not happen this time? . . . But what's your base assumption for what the competition*
 3 *will do sort of in terms of bit growth this year?* A: Again, I think the last cycle was a little different
 4 with that instability in supply created by the Hynix fire. *I don't know why they would intentionally*
 5 *repeat the mistake from last cycle. They probably are enjoying making good margins. . . . Samsung*
 6 *is actually probably on the low end over the next couple of years relative to what's going on in the*
 7 *industry as a whole. And the industry as a whole is probably a little bit south of where we think*
 8 *demand growth is.”*

10 161. On March 23, 2017, Micron also reiterated an industry-wide forecast of bit supply
 11 growth between 15-20% and demand growth between 20-25%: “It's still, in our view, 15% to 20%
 12 supply growth this year, could actually be less than that if there's less new wafers than we have in
 13 our plan. Demand is still 20% plus.” An investment analyst asked if Micron would add wafer
 14 capacity because of “such strong pricing out there in the market.” Micron's CEO, Mark Durcan,
 15 responded that it indeed had the space to add wafer capacity in its manufacturing centers in the face
 16 of strong demand, but still insisted that Micron would not add supply – maintaining the industry
 17 consensus: *“We're not focused on adding more supply. . . . We do have white space in both our*
 18 *Fab 16 in Taichung as well as Fab 10X, but we're not planning any capacity additions this year.”*

20 162. On April 25, 2017, an investment analyst asked SK Hynix on its first quarter 2017
 21 earnings call if it had plans to expand its supply growth above the 20% rate that matched the supply
 22 growth range of Micron and Samsung. SK Hynix stated that “DRAM demand growth is expected to
 23 be a little over 20% this year, which is expected to outpace supply growth. There are not enough
 24 clean room space to significantly increase DRAM capacity, and the pressing need to invest in 3D
 25 NAND will leave less financial room to invest in DRAM.” SK Hynix acknowledged its capacity to
 26 potentially grow supply faster but said its current projection of 20% growth remained its plan for
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1 2017: “Q: I believe you’re saying in line with the market about 20% . . . is there any possibility [for
2 DRAM bit growth] to go higher than that 20% mark. . . ? A: the current projection for about 20%
3 level growth is also based on the assessment of . . . all of the factors.”

4 163. On April 27, 2017, Samsung’s Sewon Chun attributed rising DRAM prices to an
5 industry wide restraint on supply, emphasizing that “**supply and demand continued to be solid and**
6 **price rose strongly due to restrictions of industry supply.**” Samsung again forecast on its quarterly
7 earnings call that for 2017 “we expect DRAM market bit growth to be high-teens and we expect to
8 grow in line with the market.” Samsung also reaffirmed an analyst that it would not add additional
9 wafer capacity apart from that necessary to offset wafer loss from technology transitions: “Q: you
10 know, recently, the DRAM industry has been seeing a very tight supply and demand situation, not
11 only Samsung Electronics, but overall, the DRAM industry is seeing an uplift in its performance.
12 Many people looking into the market are very interested in Samsung Electronics’ DRAM investment
13 plan because it has a large impact on forecasting the industry outlook for the second half of this year
14 as well as first half of next year. There’s also talk of Samsung Electronics, for example, shifting its
15 Line 11 to another product. So in that context, can you give us a bit more detail of how you plan to
16 operate your DRAM capacity? A: . . . In the DRAM, we will continue to invest supplementary and
17 also investing capacity to make up for the loss that happens as we migrate to the 1X. But other than
18 this, we have no plans of additional capacity.”

19 164. On May 24, 2017, Micron’s CFO, Ernie Maddock, reassured industry analysts at the
20 JP Morgan Global Internet, Media and Technology Brokers Conference that Micron and its
21 competitors – unlike previous years – were being careful not to add supply: “if you listen to the
22 commentary coming from industry participants on the supply side it reflects a great deal of discipline
23 and thoughtfulness with respect to how the industry participants are considering supply expansion. . .
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1 . Although we don't speak for the industry, the other participants have spoken and indicated a great
2 deal of discipline."

3 165. At the same event, Micron made announcements on supply growth that matched those
4 of its competitors the previous month and affirmed the industry consensus of growing supply 15-
5 20%: *"on the DRAM side you're going to see somewhere between 15% and 20% growth in bits*
6 *supplied, that's something that the other suppliers in the market are also saying, within reasonable*
7 *range."*²² Micron emphasized that its plans to not add wafer capacity in 2017 were consistent with
8 that of Samsung and SK Hynix and would allow each participant to maintain supply growth between
9 15-20%: "Q: their view was, exiting this year, industry capacity is probably flat. And I don't know *if*
10 *you have a view on total industry capacity dynamics, and your sense of where that could be exiting*
11 *this year? A: I think that's reasonably consistent with certainly what we've said about our intent,*
12 *and then certainly the public comments of the other industry participants have been pretty much*
13 *exactly that.* That while you do get some wafer loss as a result of technology transitions, the intent
14 that we have is to maintain flat wafer outs, so essentially you are adding a little bit of capacity to
15 make up for those lost wafer outs, but as an industry as a whole, you are not adding substantial
16 incremental industry wafers and that would contribute to or allow you to get into this 15% to 20%
17 range in terms of bit growth."

18 166. On June 6, 2017, Micron's CFO, Ernie Maddock, in response to a question about
19 "why the memory chip industry strongly recovered in the past several quarters," yet again reiterated
20 at the Bank of America Merrill Lynch Global Technology Conference that the industry was
21 systematically keeping supply growth constrained at 15-20%, even as DRAM demand grew 20-25%
22 on a yearly basis: "So, on DRAM, we have been saying for some time that we thought that from a
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27 ²² Micron Technology's (MU) Management Presents at JP Morgan Global Internet, Media and
28 Technology Brokers Conference.

1 demand perspective, that demand was going to be somewhere in the range of 20% to 25% year-on-
2 year bit growth. And in fact, we feel that's a reasonable estimate to use for the next few years at least
3 out as far as we would think about and model the business. And then from a supply side, we think
4 that even with some very modest wafer additions by the industry essentially keeping wafer output
5 flat in the face of declining bits coming simply from technology transition that aggregate bit growth
6 from a supply point of view is going to be somewhere in the range of 15% to 20%."

8 167. To maintain the DRAM industry's strength, Maddock stated that going forward "over
9 the course of a multi-year period" the three industry participants who controlled the market should
10 maintain this supply shortfall and remain disciplined about not adding supply: "*it feels as very much*
11 *as if you'll have good balance between supply and demand as long as capital discipline is*
12 *exercised. And certainly Micron has indicated the difference to be reasonably disciplined with its*
13 *capital investments, and other industry competitors in their particular public disclosure have said*
14 *similar things.*" Micron's comments explicitly suggest interdependent action where each of the three
15 DRAM suppliers agreed not to add supply capacity despite rapidly increasing DRAM prices: "Q:
16 Maybe another way of looking at the overall of the DRAM industry today's margins very high, so
17 that could be sort of the temptation for your competitors because this is borrowing cost very low,
18 right . . . don't you expect any competitors tend to irrationally backing on the better, cyclical
19 momentum? A: *I can say our view of industry bit demand will have to be materially different than*
20 *in the peers to be today to begin to have to think about expanding capacity* well beyond where we
21 are thinking today which is predominantly to get that capacity through technology transition. . . . *I*
22 *don't think our view of how we look at the industry is very – very different then how other rational*
23 *smart people sitting and other competitors tend to look at the industry.*"

26 168. On June 8, 2017, Micron's CFO, Ernie Maddock, again reaffirmed at the Robert W.
27 Baird Global, Consumer, Technology & Services Conference that each of the three DRAM
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1 manufacturers were refusing to add wafer capacity in the face of rapidly rising DRAM prices:
2 “[T]here has actually been much more disciplined behavior on the part of the remaining industry
3 participants, of which there are now only 3, it’s Micron, Samsung and Hynix. And so while each of
4 us is assessing the market, looking at the market, ***I think there’s great consistency between suppliers***
5 ***relative to our view of market growth opportunities on the demand side. And what you see being***
6 ***exercised today is disciplined investment around expansion of capacity relative to expansion of***
7 ***demand.*** And each one of us has made our own independent comments on what we think makes
8 sense for our particular company. In Micron’s case, we said that we have no plans for additional new
9 wafer fab capacity that we will get the bits that we require to serve the market from technology
10 transitions.”
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12 169. Throughout this quarter, DRAM prices continued to rapidly rise. Yet, the supply
13 discipline remained strong as each of the Defendants kept supply growth below demand growth, only
14 further fueling the price increases. The competitors also publicly reassured each other that they
15 would avoid competing against each other for market share.
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17 170. On June 29, 2017, Micron on its third quarter 2017 earnings call reaffirmed that the
18 total DRAM industry bit growth “would be between 15-20% . . . below our view of demand growth,”
19 despite rapidly rising DRAM prices. Micron then strongly reiterated that it had no plans to add wafer
20 capacity, stating that “in terms of any new capacity, I mean, we would certainly have to first make
21 sure that we have captured the maximum potential of our technology transition capability in
22 manufacturing. And then we’ll have to certainly see that there is sustained projection or sustained
23 demand growth in the years ahead before we consider adding new capacity.” Micron’s investors
24 even questioned Micron’s CFO closely on whether its plans to limit supply growth would not cause a
25 loss of market share that led to profit loss: “Q: Could you help us just kind of frame, is there enough
26 sort of mix up opportunity during the first half ‘18 where even though you might be losing some bit
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1 share, you might not be losing sort of profit share in the industry? A: . . . we talked about our bit
2 growth in context of an industry that we were estimating. But we also used the words at or slightly
3 below, not materially below.”

4 171. On July 25, 2017, Hynix similarly told investors on its second quarter 2017 earnings
5 call that its DRAM shipment growth for the year would be “at low 20%, on par with the market.”
6 Hynix further stated that “supply is expected to keep falling short of demand growth despite the
7 increase in mobile DRAM supply. For the year, supply growth is likely to remain slightly slower
8 than demand growth. Suppliers who can significantly increase DRAM capacity do not have enough
9 clean room to do so, and the pressing need to invest in 3D NAND will leave less financial room for
10 investment in DRAM.”

11 172. Samsung, two days later on July 27, 2017, stated that it too was forecasting its bit
12 growth to be in the high teens, and that Samsung expected “our bit growth to be in line with the
13 market.” Samsung’s Sewon Chun again attributed high DRAM prices to industry restraints on
14 supply, stating that “*due to restriction of industry supply, supply and demand remained solid and*
15 *price continued to rise.*” Samsung stated that it would not disrupt the industry by adding DRAM
16 capacity in an attempt to fight for market share: “Next year, we are considering possibly converting
17 some of the NAND capacity to DRAM, but the actual timing or size of that will depend on the
18 market situation that unfolds next year. *As we have always emphasized in the conference calls, we*
19 *will refrain from, for example, increasing market share, fighting on volume.* We manage our
20 business with a profitability focus. And so, we will flexibly manage our capacity by very closely
21 monitoring the market situation, as well as the supply and demand balance.” Samsung’s statements
22 represent a change in behavior from its prior practice in 2014-2015 of competitively adding supply in
23 an attempt to take market share from competitors.
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173. Micron's CEO, Sanjay Mehrotra, within two weeks of the public comments of Samsung and Hynix, confirmed on August 7, 2017, at the KeyBanc Capital Markets Annual Global Technology Leadership Forum Conference that each of the three competitors were taking the same, interdependent approach to bit supply growth – maintaining it below 20% even as demand growth exceeded 20%: “Q: Have you -- either of you’ve seen any changes in the market with respect to recent commentary and related to what Samsung or Hynix said on the earnings calls in terms of bit supply that would be of any concern or CapEx plans that would be of any concern? A: ***I think overall bit supply in the industry is in 15% to 20% range.*** And when you look at the bit supply growth perhaps, may be little bit toward the higher end of that 15% to 20% range. But, ***the demand projection, again, from all the mega markets that I earlier talked about, point to greater than 20% demand for the industry.*** So, I do believe that for 2017 and heading into 2018 as well, the industry fundamentals will be healthy.” Micron's CEO also emphasized that Micron, Samsung, and Hynix controlled 95% of the DRAM market: “95% of the industry is supplied by three players, and Micron has a solid position in the DRAM industry. So, that's a great position to be in.”

174. On September 6, 2017, Micron's CFO, Ernie Maddock, reassured investors at the Citi Global Technology Conference, that industry consolidation over the last several years allowed Micron and its competitors to exercise mutual discipline over supply growth and that he expected that “discipline” to continue into the future: “I do think ***consolidation has been very instrumental in having a disciplined and orderly expansion of supply.*** We have certainly seen that now over period of a couple of years and we expect based on everything that we can see that you're going to continue to have a disciplined expansion of supply as we look forward into fiscal '18 for Micron.” Maddock emphasized a shared, publicly stated desire among Micron, Samsung, and Hynix to keep wafer capacity flat: “***if you listen to the public commentary of the industry participants, the key message across the Board is that the investments are mainly for technology transition with the desire to***

1 *keep wafer starts roughly flat.*” Maddock was clear that keeping wafer capacity flat would allow
2 Micron, Samsung, and Hynix to keep supply growth below demand growth: “this will allow the
3 industry to *grow bits at this 20% plus or minus range* over the course of any given year and
4 certainly that feels very well matched to what we believe the demand to grow from a supply point of
5 view, which is in the 20% to 25% range.”
6

7 175. On September 27, 2017, Micron reassured investors on the fourth quarter 2017
8 earnings call that it expected the “industry to remain moderately undersupplied for the rest of 2017
9 for . . . DRAM.” Micron’s CFO, Ernie Maddock, told investors that it would not grow its supply
10 capacity faster than that of industry participants and thus would maintain the industry consensus: “Q:
11 [A]t what point, do you think you begin to start to outgrow bits relative to the industry for [DRAM]?
12 A: I would also tell you that our objective over a multiyear period is to grow at about industry levels
13 . . . *really important is the segment that we intend to grow aligned with industry* over the course of
14 these multiyear periods.” Despite undersupply in the DRAM market, Micron stated that it intended
15 for its DRAM bit growth for 2018 to “be slightly below the industry growth rate.”
16

17 176. SK Hynix, less than a month later on October 26, 2017, also told investors on its
18 quarterly earnings call that the DRAM market was in a state of undersupply and that SK Hynix
19 would not be able to quickly ramp up wafer capacity to satisfy this undersupply in the market. In
20 particular, Hynix stated that “DRAM demand growth forecast has been adjusted upward to mid-20%
21 level from the initial low 20% level. Thanks to the higher-than-expected growth in demand for server
22 DRAM. As a result, the undersupply is likely to continue for some time despite the attempts to
23 increase supply. Particularly for DRAM, there is much slower productivity gains from technology
24 migration. The migration process itself is becoming more complex, with more steps in the process,
25 more equipment needed and production time becoming longer than before.” SK Hynix also told
26 investors that it intended to grow its DRAM capacity in 2018 in line with the market.
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1 177. Samsung, on October 31, 2017, told investors on its quarterly earnings call that it was
2 actually adding less DRAM capacity than previously planned despite rapidly rising prices because
3 “our basic approach to DRAM capacity management is that we will flexibly manage our capacity
4 especially depending on the market situation for each product.” Samsung emphasized that for the
5 year, Samsung’s DRAM bit growth for the year had been *below* the industry, stating that “2017
6 market DRAM bit growth [will] be approximately 20% and our bit growth will be mid-teens.”
7 Samsung’s Sewon Chun continued to attribute high DRAM prices to industry restrictions on supply,
8 stating that because “*the overall restriction of industry supply stays, price continued to rise on the .*
9 *. . supply-and-demand conditions.*”
10

11 178. Throughout this period, Samsung had the highest market share in the DRAM industry.
12 As explained previously, Judge Posner has recognized that “declining market shares of leaders” is a
13 plus factor potentially indicative of cartel conduct.²³ On November 24, 2016, Samsung Securities
14 stated that Samsung Electronics “could increase equipment investment for its #17 line to gain market
15 share, but it appears more focused on profitability, even at the expense of losing DRAM market
16 share.” Samsung acknowledged on October 31, 2017 that it had lost market share that year but stated
17 that it would not seek to regain market share by growing supply more rapidly than the market: “Q:
18 this is the first time that Samsung Electronics has lost market share in DRAM? Does it plan to regain
19 its previous market share next year or will you be more trying to maintain where you stand
20 currently? A: It’s a bit too early for us to give you specifics about what we plan to do with DRAM,
21 but the current guidance that we can give you is that for next year, our bit growth for DRAM is
22 expected to be at market growth levels.”
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28 ²³ See Richard A. Posner, Antitrust Law, 79-93 (2d Ed. 2001).

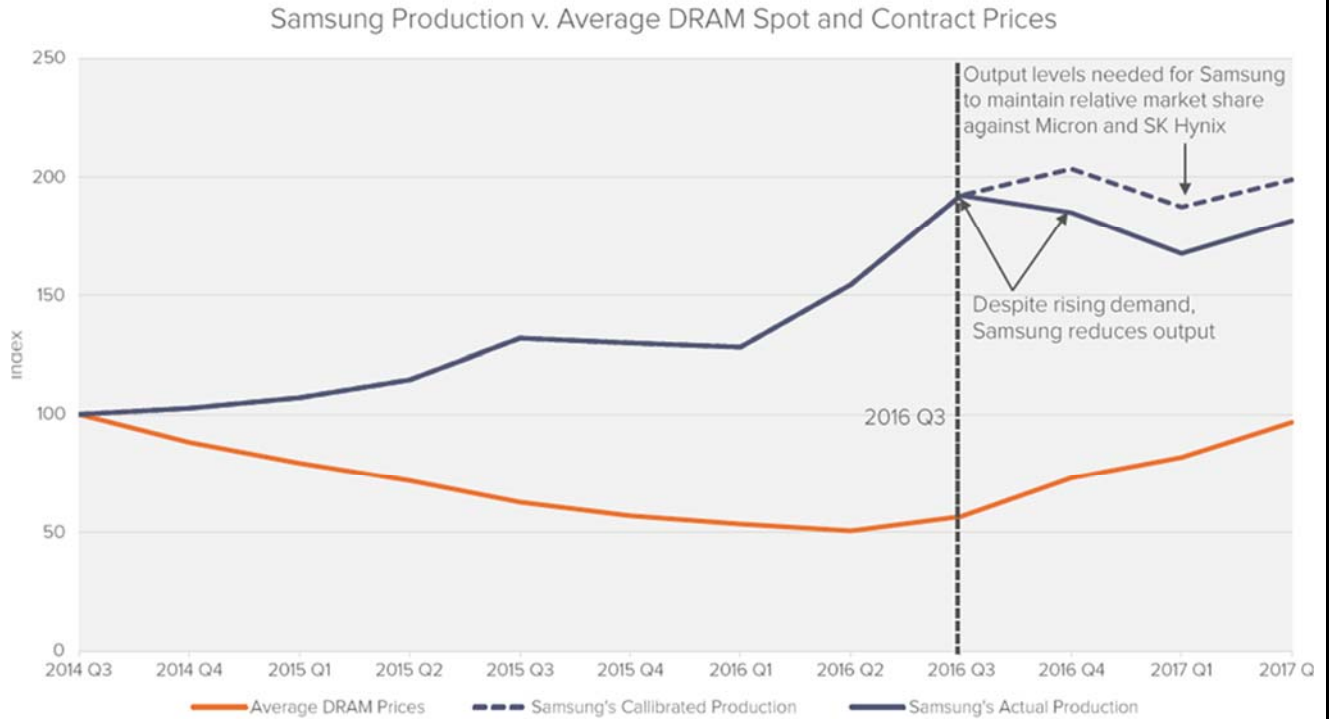
179. Through the end of 2016, DRAM prices began to rapidly increase. By February 2017, DRAM spot prices had nearly doubled since their low in the spring of 2016. Throughout this period, Micron repeatedly stated publicly that Samsung and the other Defendants would not repeat the mistaken actions from the previous years, particularly in 2014, and add significant new DRAM capacity in the face of steady demand and rising prices.

3. In the second half of 2016, Defendants sequentially reduced output, thus sacrificing profits and market share against each of their own unilateral self-interests.

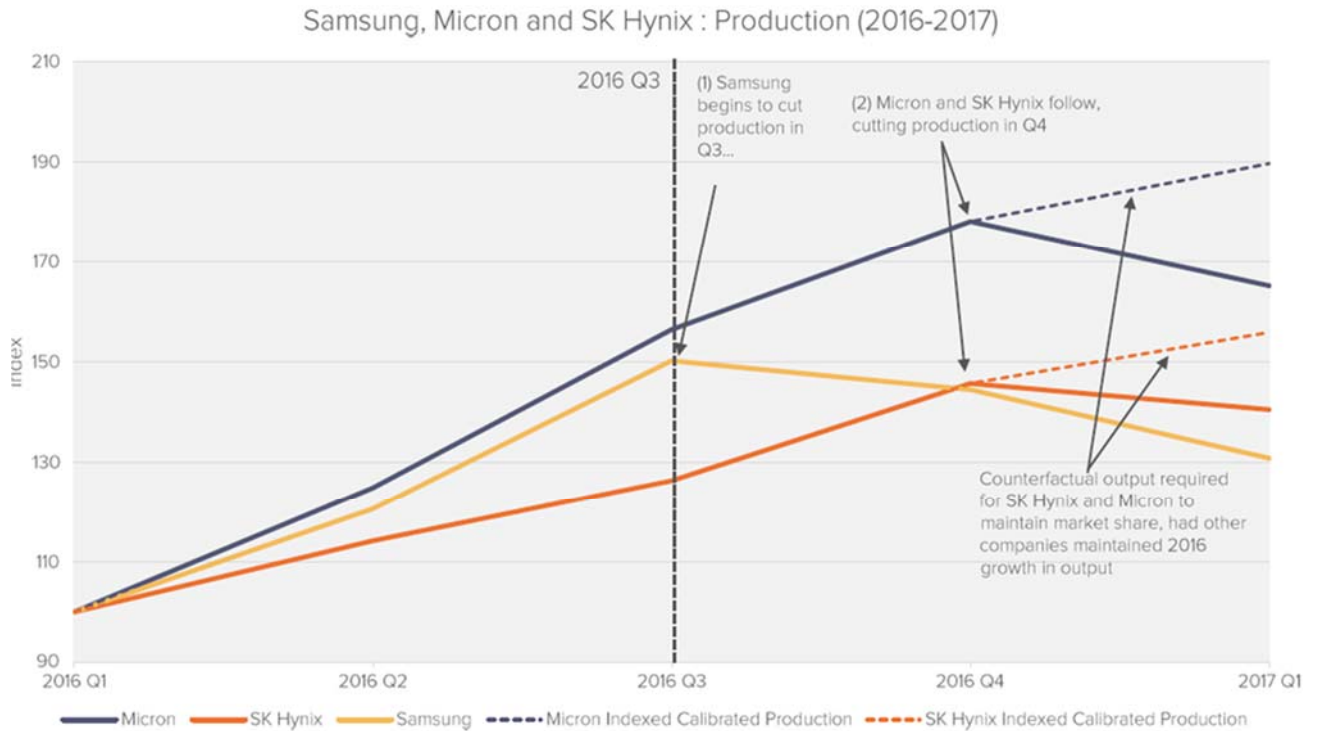
180. Data compiled from Bloomberg also shows that the Defendants took actions against their own unilateral self-interest in the second half of 2016.²⁴ Throughout this period, DRAM demand continued to rise, as documented on Defendants' earnings call. However, Defendants did not make the economically rational market decision to continue to increase supply to meet demand, as they had done during the pre-conspiracy period.

181. First, in Q3 2016, Samsung made a unilateral decision to reduce its DRAM output by 50 million gigabytes, even as demand rose. This reduction in output caused Samsung's share of the total market to decrease from approximately 50% in Q3 2016 to 45% in Q4 2016. Furthermore, the output cut was against Samsung's unilateral self-interest because it cost itself approximately \$47 million in additional profits that it would have earned if it had simply maintained its output. The output cut is shown on the following chart:

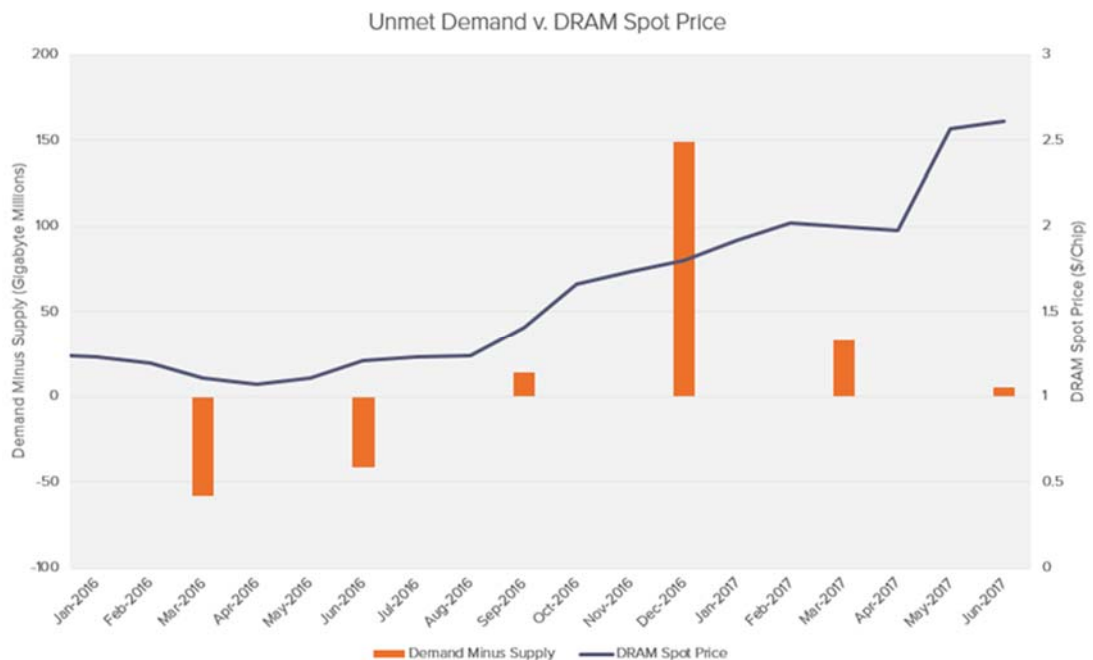
²⁴ The following analysis is based on data compiled by IDC, an independent data company, and made available through Bloomberg. According to IDC, its DRAM supply data is based on supplier shipment surveys that access the flow of branded shipments by the major suppliers in the market. IDC then reconciles the survey results with primary and secondary research, including its own capacity database, which tracks product roadmaps, competitive data points such as die size and wafer starts, and supplier investment plans. For demand, the IDC semiconductor group estimates gigabytes per system trends and combines the research with IDC's electronic equipment unit forecasts.



182. Second, the following quarter both Hynix and Micron then responded with production cuts of their own, even as demand continued to rise during the period. If either Defendant had increased their production in response to Samsung's cut, they would have immediately earned a higher profit and driven the market back to a competitive equilibrium. If Hynix had increased production to counterfactual output levels, then it could have claimed 3% additional market share and earned \$27 million in additional profits. If Micron had increased production to counterfactual output levels, it could have claimed 3% additional market share and earned \$30 million in additional profits. Micron and Hynix's production cuts were each against their unilateral self-interest and inconsistent with a competitive market. Micron and Hynix's production cuts are illustrated on the following chart:



183. Defendants' actions created an unprecedented increase in unmet demand for DRAM, which matched the tremendous rise in DRAM prices during the conspiracy period:



4. Throughout 2017, Defendants repeatedly reassured each other that, unlike in previous periods, each would not respond to rising prices and strong demand with increased supply growth. Instead, the Defendants would stick with their

1 **publicly announced plans to keep supply growth below demand growth by not**
2 **adding wafer capacity and not seeking to take market share from each other.**

3 184. On March 9, 2017, Micron's CFO, Ernie Maddock, told investors at the Susquehanna
4 Semi, Storage & Technology Conference, that Micron had no "plan to add [DRAM] wafers in any
5 form," would not be attempting to increase its market share and that it would "provide maximum
6 benefit" to Micron to be "public about the fact that we have no current plan to add wafer capacity."
7 Maddock alleged that its competitors shared the same approach of not growing supply in an effort to
8 take market share, stating "all of the statements and all of the actions thus far suggest the things may
9 indeed be different in terms of how the participants are thinking about, the balance of profitability
10 versus market share."

11 185. Throughout most of 2017, Defendants communicated that each of the Defendants was
12 taking the same shared approach. For example, on June 8, 2017, with DRAM prices having risen
13 20% in the last month, Micron's CFO told investors at the Robert W. Baird Global Consumer,
14 Technology & Services Conference that "there has actually been much more disciplined behavior on
15 the part of the remaining industry participants, of which there are now only 3, it's Micron, Samsung
16 and Hynix. And so while each of us is assessing the market, looking at the market, I think there's
17 great consistency between suppliers relative to our view of market growth opportunities on the
18 demand side. And what you see being exercised today is disciplined investment around expansion of
19 capacity relative to expansion of demand." And on July 27, 2017, Samsung assured investors on its
20 quarterly earnings call that it would not try to take market share from its competitors: "As we have
21 always emphasized in the conference calls, we will refrain from, for example, increasing market
22 share, fighting on volume."

23 186. Even as DRAM prices continued to rise throughout 2017, the Defendants stuck to
24 their common plan of not adding wafer capacity even though each had space to add such supply to
25 meet the steady demand. For example, on September 6, 2017, Micron's CFO, Ernie Maddock, at the
26 27
28

1 Citi Global Technology Conference, emphasized a shared, publicly stated desire among Micron,
2 Samsung, and Hynix to keep wafer capacity flat: ***“if you listen to the public commentary of the***
3 ***industry participants, the key message across the Board is that the investments are mainly for***
4 ***technology transition with the desire to keep wafer starts roughly flat.”***

5 187. Micron’s CEO, Sanjay Mehrotra, reaffirmed on November 28, 2017 at the Credit
6 Suisse Annual Technology, Media & Telecom Conference the industry-wide approach of not adding
7 significant wafer capacity and keeping supply growth below demand growth: “For fiscal year ’18,
8 what we have said is industry supply bit growth in 20%, around 20%, while the demand trends, I
9 believe, will continue to be somewhat stronger than that” . . . “there may be some wafer capacity
10 additions [in the industry] but they will remain relatively small.”

11 188. Micron’s CFO confirmed on December 6, 2017 at the Nasdaq Investor Conference
12 that the industry planned to keep wafer capacity flat for several years despite rapidly rising DRAM
13 prices: “We are not adding wafers for either technology in 2017. I think if you look at the public
14 comments of other suppliers they are adding marginal numbers of wafers. But ***essentially if you look***
15 ***at the industry in aggregate even at the end of 2018 it’s altogether possible for DRAM that the***
16 ***number of wafers the industry produces is the same or slightly less than it was some years ago.”***
17 Micron’s CFO flatly stated that Micron and its competitors shared a common agreement to constrain
18 DRAM supply: ***“if you look at the public commentary of all the industry participants . . . I think***
19 ***there is a general belief that the industry participants are keenly aware of the fact that the DRAM***
20 ***market is relatively inelastic and the way you serve that market is by making sure there is***
21 ***adequate, but not excess supply.”***

1 **5. From 2016-2017, Samsung changed its prior behavior and stopped trying to take**
 2 **market share from competitors, which is consistent with the collusive objectives**
 3 **identified by Confidential Witness 1.**

4 189. On January 29, 2016, Samsung stated, “For 2016, for the whole year, the DRAM
 5 market bit growth, we expect mid-20%, and our bit growth is expected to grow align with the
 6 market.” Samsung’s forecast growth rate matched that proposed by Micron several weeks earlier.
 7 Samsung stated that it was going to focus on profitability rather than market share in 2016: “And we
 8 will be able to grow our supply, we’re planning, at market growth levels. *This year our main focus*
 9 *will be on profitability rather than increasing volume.* So our main approach this year on the
 10 DRAM side is to maintain our leadership and also continue an operation that is sustainable and
 11 profitable.” Samsung’s statements were in line with what CW I understood to be the reason Samsung
 12 Korea’s Sewon Chun told Mr. Temprano in early 2016 to leak Samsung’s confidential price-increase
 13 plans – to ensure that Samsung’s competitors would know what it was planning to do.

14 190. On May 25, 2016, Micron CEO, Mark Durcan, at the J.P. Morgan Global Technology
 15 Media & Telecom Conference, stated that in 2014, Samsung “added some wafer probably more than
 16 they in retrospect would have.” Durcan claimed that while he did not “think the intention was to
 17 oversupply the market,” it caused the “market [to become] out of balance.”

18 191. On October 27, 2016 Samsung announced on its quarterly earnings call that its bit
 19 growth for 2017 would be in line with “market bit growth” and that “as we have always mentioned,
 20 regarding DRAM, *our focus is not to increase our market share but to maximize our profits.* And
 21 so our investments as well as production will also be flexibly managed according to how the market
 22 unfolds.” Of course, that actually reflected a change in strategy from what Samsung had stated a year
 23 earlier, on January 29, 2015, *see supra*, when Samsung said it had the capacity to increase production
 24 and would increase production if it saw shortages or increasing demand.
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 26
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1 192. In December 2016, with DRAM prices rising, Micron twice affirmed that Samsung
2 had changed its behavior. On December 7, 2016, Micron Senior Vice President and Chief Financial
3 Officer, Ernie Maddock, publicly stated at the Barclays Technology Conference that when it added
4 DRAM capacity in 2014, that was the last time “supply came into the industry and that there was a
5 new fab that was brought online by one of our competitors [Samsung].” Mr. Maddock lamented that
6 those capacity additions had put “pricing pressure on the [DRAM] business,” but that things were
7 now different because “with the absence of capacity additions” in 2016 “now you’re back into this
8 fundamentally healthier period.”

9
10 193. And, on December 21, 2016, Micron, on its first quarter 2017 earnings call, again
11 signaled that the Defendants, including Samsung, had learned their lesson, and that this time – in the
12 midst of the rising prices and steady demand – Defendants would not be adding supply as they did in
13 2014. In answering a question as to why the current period would be different for the industry than
14 what occurred in 2014, Mr. Maddock responded that in 2014 there was a “little bit of a
15 miscalculation by one of the suppliers.” Maddock stated that he understood that Samsung had
16 “learned from” that “miscalculation.”

17
18 194. By 2017, Samsung had completely reversed its prior pattern of competitively adding
19 market share, had grown market share *less* than its competitors, and was not planning to take market
20 share from competitors despite its supply capacity. On October 31, 2017, Samsung stated on its
21 quarterly earnings call that its bit growth for the year would be *below* market that year: “For DRAM,
22 in the third quarter, our bit growth came in high single-digit and our ASP grew high single-digit as
23 well. For the Q4, we expect market DRAM bit growth to be low single-digit and we expect our
24 growth to be similar. That will bring the 2017 market DRAM bit growth to be approximately 20%
25 and our bit growth will be mid-teens.” An analyst noted that this was the first year that Samsung had
26 lost market share; Samsung implied it had no plans to try to outgrow the market to take back market
27
28

1 share. “Q: this is the first time that Samsung Electronics has lost market share in DRAM? Does it
 2 plan to regain its previous market share next year or will you be more trying to maintain where you
 3 stand currently? A: It’s a bit too early for us to give you specifics about what we plan to do with
 4 DRAM, but the current guidance that we can give you is that for next year, *our bit growth for*
 5 *DRAM is expected to be at market growth levels.*”
 6

7 195. CW 1, a former Samsung North America executive, noted this change in strategy and
 8 action. CW 1 regularly attended quarterly meetings between Samsung Electronics executives, based
 9 in Korea, and Samsung Semiconductor executives, based in North America where DRAM pricing
 10 was discussed. CW 1 stated that Samsung Electronics executives in Korea controlled supply and had
 11 ultimate authority on prices. Pricing decisions for U.S. customers emanated out of Korea – not the
 12 U.S. headquarters in San Jose. Samsung Semiconductor executives in North America handled sales
 13 of DRAM and were compensated based on their total revenue, thus incentivizing them to compete on
 14 DRAM pricing to win business and increase their own commissions. CW 1 observed that in 2016
 15 and 2017, Samsung Electronics executives in Korea were less likely than before to grant pricing
 16 decreases on DRAM to win business as requested by Samsung Semiconductor executives. Samsung
 17 Semiconductor executives expressed frustration at this change in Samsung’s behavior because it cost
 18 them potential sales.
 19

20 **C. End of Conspiracy: Once the Chinese Investigation was Announced, Defendants’**
 21 **Conduct Changed Abruptly**

22 196. DRAM prices continued to climb, and then abruptly stopped in early 2018, just after
 23 China’s antitrust regulator, the NDRC, announced that it had begun an investigation into the DRAM
 24 industry due to the noticeable and sharp rise in the price of DRAM over the 18-month period from
 25 June 2016 to December 2017.
 26

27 197. On December 27, 2017, a *Reuters* article reported that China’s NDRC was
 28 investigating possible price-fixing in the DRAM market. Reuters reported that the investigation was

1 looking into possible coordinated action taken by “a number of firms to gain maximum profits by
2 pushing the price of the product as high as possible. A ‘super cycle’ of tight supply and soaring
3 demand for memory chips, which power servers and smartphones, has been driving up prices and
4 profits at chipmakers such as Samsung Electronics Co., Ltd. and SK Hynix, Inc. which control the
5 lion’s share of the global market.”
6

7 198. As Xu Xinyu, an official with the Pricing Supervision Department of China’s NDRC
8 put it: “We have noticed the price surge and will pay more attention to future problems that may be
9 caused by ‘price fixing’ in the sector.” Xu Xinyu referred to “coordinated action taken by a number
10 of companies, pushing the price of the product as high as possible to gain maximum profits.”
11

12 199. On February 1, 2018, it was reported that the NDRC and Samsung signed a
13 Memorandum of Understanding that would result in moderations to the price increases of DRAM in
14 2018. It was reported on May 24, 2018 that the NDRC met with Micron to express concerns about
15 price increases for PC DRAM products.

16 200. In April 2018, Hynix publicly announced that it was adding wafer capacity by 6-7%
17 per year in order to meet demand growth. This addition of wafer capacity was a change in practice
18 from the Class Period where the Defendants artificially constrained the growth of wafer capacity in
19 order to inflate the price of DRAM.
20

21 201. DRAM prices began to quickly fall after the Chinese NDRC announced its
22 investigation and Defendants began to increase their supply. These falling DRAM prices have
23 continued until the present. In August 13, 2018, DRAMeXchange predicted that DRAM prices
24 would decline 15-25% in 2019 because “the bit supply growth in the whole industry will be greater
25 than demand growth.” On November 5, 2018, DRAMeXchange reported that “the average price of
26 4GB PC DRAM modules for 4Q18 contracts has dropped by 10.14% QoQ from US\$34.5 in 3Q18 to
27 the current US\$31. As for the average contract price of 8GB PC DRAM modules, it has dropped by
28

1 10.29% QoQ from US\$68 in 3Q18 to the current US\$61. Since the DRAM market has just entered
 2 oversupply, DRAmEXchange does not discount the possibility of further price declines in November
 3 and December.” On March 5, 2019, DRAmEXchange reported that prices had declined nearly 30%
 4 in the PC DRAM Market for Q1 2019, which was the sharpest decline in a single season since 2011.
 5 On August 8, 2019, DRAmEXchange reported that “quote trends for various products, including
 6 commodity DRAM, server DRAM and consumer DRAM, fell by nearly 30%.”

8 202. In November 2018, Wu Zhenguo, head of the Chinese Anti-Monopoly Bureau, stated
 9 that the “investigation into these three companies [Samsung, Hynix, and Micron] has made important
 10 progress . . . it has yielded massive evidence.”

11 203. Director Wu also stated that the agency had “obtained and screened evidence from”
 12 Samsung, Hynix, and Micron (and their downstream partners) in connection with the ongoing
 13 investigation. Furthermore, Director Wu stated that representatives of the companies had come to
 14 and communicated with the Bureau.

16 204. Based on media accounts, the Chinese investigation into Defendants’ conduct is
 17 ongoing.

18 205. Defendants’ illegal behavior, alleged herein, artificially stabilized and raised the
 19 prices of DRAM during the Class Period. As a result, DRAM prices were higher than they would
 20 have been absent the conspiracy.

22 **VI. DEFENDANTS’ INCREASED PRICES FOR DRAM CANNOT BE EXPLAINED BY MARKET FACTORS**

23 206. The rise in DRAM prices cannot be legitimately explained away by the economics of
 24 the market. Leading up to and during the Class Period, costs remained low or stable and there were
 25 no technological or other impactful events, such as unexpected growth in demand, that would explain
 26 the extraordinarily high prices for DRAM during that time.
 27
 28

A. DRAM costs remained low or stable during the Class Period

207. DRAM is primarily made from raw material silicon wafers and, therefore, every DRAM chipmaker needs to buy them so that they can be processed into chips. Yet, while prices for DRAM soared, the prices of silicon wafers – the primary component in DRAM – declined or remained stable. For example, between 2013 and 2017, silicon wafer prices declined about a third, and more than a half since 2007 levels.

208. During the Class Period (and the years leading up to its start), research and development costs and capital expenditure costs for Defendants to produce DRAM also remained fairly stable.

209. Despite the lack of increases in raw material or other input costs, DRAM prices soared during the Class Period to astronomical levels. The average selling price (“ASP”) for DRAM rose by more than 40% between 2016 and 2017.

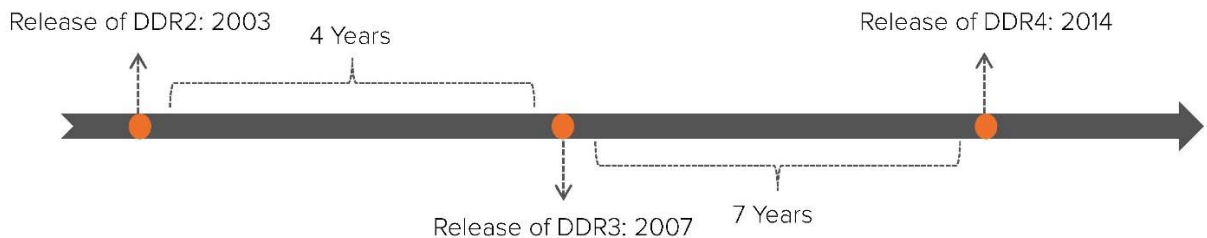
210. Prices for DRAM started to rise in the second half of 2016, and continued to rise during the Class Period. For example, PC DRAM (DRAM that is installed into computers) experienced one of the biggest upticks in contract pricing, likely ending the year 2017 with a 60% price increase over 2017. “The average contract price of mainstream 4GB DDR4 PC DRAM modules, for example, soared from \$13 at the end of Q2 2016 to \$30.5 in Q4 2017,” said April Wu, research director for DRAmEXchange. “This represents an increase of 130 percent over six consecutive quarters.”

B. Price increases during the Class Period cannot be explained by the technology life cycle or unexpected increases in demand

211. The DRAM market is characterized by rapid technology advancements. As a new generation of DRAM comes to market (and replaces the prior generation), prices for the new generation can be expected to rise. Prior to the Class Period, this was the case with the transition of the product life cycle of DDR2 DRAM to the next generation, DDR3 DRAM. During the Class

Period, when the transition was made from DDR3 DRAM to DDR4 DRAM, that was not the case, and the market deviated from the traditional price cycle.

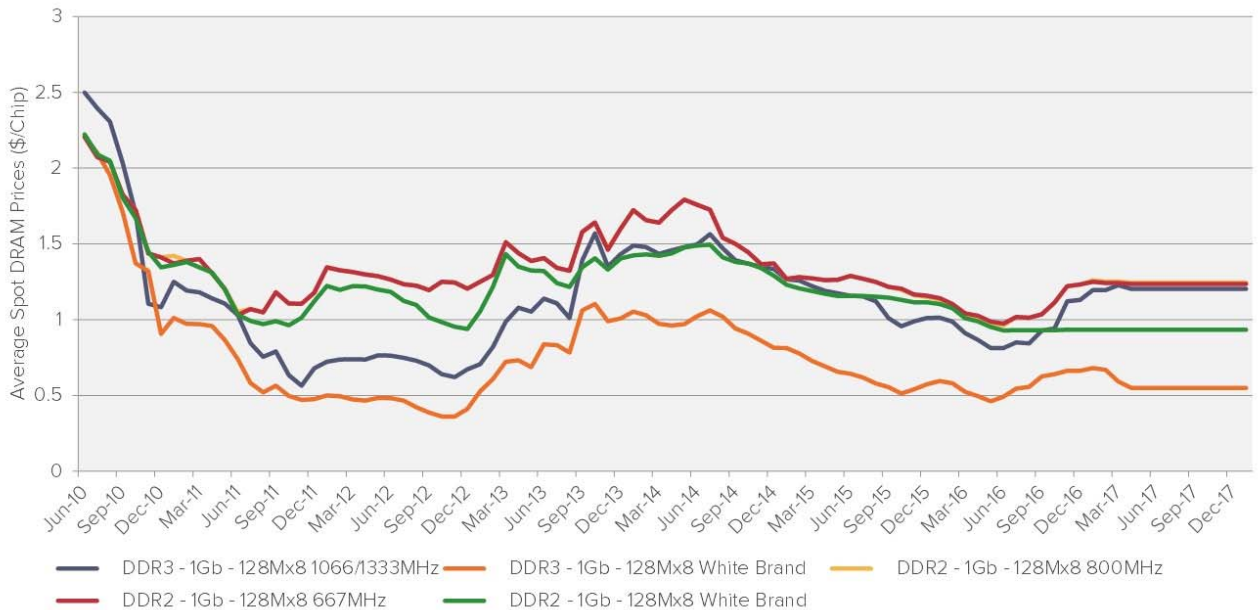
212. Additionally, manufacturers are constantly cutting costs while meeting market demands for larger memory densities with higher speed. The timeline below illustrates the transitions through DDR2, DDR3, and DDR4 types of DRAM, and indicates that the impact of those transitions would pre-date the price increases during the Class Period:



213. Technological advancements are typically characterized by the following: (1) an increase in memory density (either by reducing die size, *i.e.*, reducing the size of the chip, or reducing the process node, *i.e.*, reducing the distance between transistors; (2) an increase in the speed of a chip (speeding up the amount of data that can be transferred in a certain period of time); and (3) a decrease in energy consumption (reducing the operating current and voltage). Each time a manufacturer applies one of the above methods, there is an associated learning curve.

214. Typically, price trends in the DRAM industry are generally correlated with this product technology life cycle. At the beginning of new cycle, production and fixed costs are high to develop the next generation technology, resulting in higher prices for the new generation of DRAM. Gradually, as market demand increases for the newer generation DRAM, prices stabilize as the new generation replaces the old generation in the market. For example, as shown in the below chart, this was the case with the transition from DDR2 to DDR3 DRAM in the period December 2012 through September 2014:

Average Spot prices for DDR2 and DDR3



Source: Bloomberg.

215. The technology for DDR4 was introduced in 2014, long before the significant price increase rise that began with the start of the Class Period in June 2016. And, therefore, the transition from DDR3 to DDR4 cannot be used to explain the price increase that occurred sharply during the Class Period, as the transition to DDR4 would have occurred several years before.

Average Spot Prices for DDR4 and DDR3 by Density



1 Source: Bloomberg.

2 216. DRAM makers' decrease in the node process also does not explain Defendants' price
3 increases during the Class Period. From 2000, Defendants have been transitioning from a 130nm
4 process node technology to an 18nm process in 2016. The node process is expected to further
5 decrease to 10nm by 2020. In 2015, one year after DDR4 was first introduced, the market was
6 expected to benefit from the rising penetration of DDR4 built on 20nm technology. The transition
7 from 25nm was said to increase bit capacity by 30% at their existing production facilities. Therefore,
8 by 2016, manufacturers would have experienced sufficient increase in capacity from the move from
9 25nm to 20 nm in 2014. This timeline does not correlate with the price increases that began during
10 the Class Period; the impact of the node decreases would have come long before.
11

12 217. During the conspiracy period, there also were no unanticipated sharp increases in
13 demand that could explain the abrupt and continuous increases in prices.

14 218. In fact, the allegations in Part V, *supra*, make clear that Defendants' statements and
15 conduct show an intentional and successful effort to coordinate supply growth at a lower rate than
16 expected demand growth, which particularly for Samsung, was a stark change in strategy and
17 behavior.
18

19 **VII. THE DEFENDANTS' DRAM REVENUES INCREASED DRAMATICALLY DURING**
20 **THE CLASS PERIOD**

21 219. During the Class Period, as prices for DRAM soared, so did Defendants' revenue.
22 Defendants' revenue from global DRAM sales skyrocketed during the Class Period, with
23 Defendants' revenue rising more than 50%. Between Q1 2016 and Q4 2017, Defendants' revenues
24 from global DRAM sales more than doubled. In Q4 2017, Samsung achieved a record-high revenue
25 of \$9.77 billion from its global DRAM sales (Q1 2016 revenue was \$3.9 billion); SK Hynix achieved
26 record-high revenue of \$6.229 billion in Q4 2017 from its global DRAM sales (Q1 2016 revenue
27 was \$2.3 billion), and Micron achieved record-high revenue of \$4.0 billion in Q4 2017 from its
28

global DRAM sales (Q1 2016 revenue was \$1.5 billion). Defendants' soaring DRAM revenues as a result of the conspiracy are shown in the following chart:

Companies	DRAM Revenue (USD Million)							
	2016 Q1	2016 Q2	2016 Q3	2016 Q4	2017 Q1	2017 Q2	2017 Q3	2017 Q4
Samsung	4,005	4,389	5,343	5,727	6,381	7,509	8,492	9,770
SK Hynix	2,328	2,415	2,611	3,357	3,984	4,491	5,528	6,229
Micron	1,605	1,821	2,230	2,830	3,229	3,804	3,559	4,023

VIII. TRADE ASSOCIATION PARTICIPATION PROVIDED MANY OPPORTUNITIES FOR DEFENDANTS TO SHARE INFORMATION AND COLLUDE, WHICH CONFIDENTIAL WITNESS TESTIMONY AND THE DATA INDICATE OCCURRED

220. Trade associations also foster ease of information sharing between Defendants in the DRAM industry and provide many opportunities for Defendants to have direct communications and collude, which confidential witness testimony and the data indicate occurred.

A. Defendants' Participation in Trade Associations

1. Joint Electron Device Engineering Council ("JEDEC")

221. The JEDEC Solid State Technology Association is an independent semiconductor engineering trade organization and standardization body. JEDEC helps formulate open industry standards for DRAM. These standards help ensure that DRAM manufactured by each of the Defendants is interchangeable with one another. Samsung, Micron, and Hynix are leading members of JEDEC and play a key role in formulating JEDEC standards for DRAM. According to JEDEC's Manual of Organization and Procedure, JEDEC committee and subcommittee meetings are generally private and limited "to members, their designated alternates, and guests invited by the committee or subcommittee chairperson."²⁵

222. According to CW 3, a former Hynix marketing executive who worked at Hynix during part of the conspiracy period, JEDEC conferences occurred approximately six times a year.

²⁵ JEDEC Manual, JEDEC (Nov. 2017), <https://www.jedec.org/sites/default/files/JM21S.pdf>.

1 The meetings were typically held at hotels in desirable locations, and included approximately 80 to
2 100 people each time. Each of the Defendants sent employees to JEDEC conferences.

3 223. CW 3 states that Samsung, Hynix, and Micron have each sent leadership teams to
4 JEDEC conferences, which provided an ideal setting for Defendants to discuss future business plans.
5 CW 3 explained that “at JEDEC, you could talk to competitors about what they were seeing in future
6 volume. You can talk about overall volume expectations.” This is in direct violation of JEDEC’s
7 own antitrust policy, which states that “absent prior legal clearance and legal guidance, there should
8 be no discussion or exchange of information . . . regarding future plans concerning the production,
9 distribution or marketing of particular products; or any other statistics or figures pertaining to a
10 company’s business operations.”
11

12 **2. Semiconductor Industry Association (“SIA”)**

13 224. According to its website, SIA is the voice of the U.S. semiconductor industry. Micron
14 Technology is a member of the SIA, along with other domestic semiconductor manufacturers.
15 Samsung and SK Hynix are listed as international members of the SIA. Sanjay Mehrotra, Micron
16 Technology’s President and CEO sits on the Board of the SIA. The SIA is affiliated with companion
17 branches in other regions of the world including in Korea, Japan, China, and Europe. It is also linked
18 to the World Semiconductor Trade Statistics, a non-profit, which is the “source of semiconductor
19 market data and forecasts,” and the World Semiconductor Council. Defendants belong to all of these
20 associations.
21

22 225. The SIA holds various events, such as its “Annual Award Dinner” where Defendants
23 key executives attend. For example, at its annual dinner on November 14, 2017, Mark Durcan,
24 Micron’s CEO at the time, was featured at the event as an award winner and potential speaker. The
25 program of events for the November 14, 2017 meeting also included a CEO Reception and a Post-
26 Party, providing further opportunities for social interaction or side conversations among members.
27
28

1 **3. Korean Semiconductor Industry Association (“KSIA”)**

2 226. Similar to the SIA, the KSIA provides opportunities for Defendants to be in contract
3 and to directly communicate and share competitive information with one another.

4 227. KSIA’s membership list includes both SK Hynix and Samsung Electronics Co. on its
5 device manufacturer member list, with only four other entities listed as device manufacturer
6 members. This small number of member companies makes it even more possible for members to be
7 in contact and have a means to exchange information.

8 228. In March 2016, Sung Wook Park, the CEO and Vice Chairman of SK Hynix was
9 inducted as the 9th President of the KSIA.

10 229. The KSIA also holds events and conferences for its members. For example, the KSIA
11 has held an annual meeting each year between 1994 and 2016. SK Hynix is noted as one of the event
12 organizers for at least the 2016 annual meeting.

13 230. The KSIA is connected to the SIA and other regional branch organizations such as in
14 the U.S., Japan, China, the EU, and Taiwan. At times, the various branches get together for
15 worldwide conferences and events, providing further opportunities for Defendants to join together in
16 person.

17 231. While much of the information on these organizations is kept private for members
18 only, these organizations clearly provided a channel through which Defendants had the opportunity
19 to discuss and/or exchange information directly during the Class Period.

20 232. Given the small number of DRAM makers, these opportunities to collude lend even
21 further plausibility to Plaintiffs’ collusion allegations.

22 **4. World Semiconductor Council (“WSC”)**

23 233. The SIA is also affiliated with the World Semiconductor Council, which “promotes
24 international cooperation in the semiconductor sector in order to facilitate the healthy growth of the
25

1 industry from a long-term global perspective.” The WSC holds at least one meeting a year. Notably,
 2 the WSC held a meeting of over 100 CEOs and other semiconductor executives on May 26, 2016 (a
 3 few days before the start of the Class Period on June 1, 2016). The conference was led by Sung
 4 Wook Park (CEO of SK Hynix and President of the Korean Semiconductor Industry Association,
 5 discussed further above).

7 **5. World Semiconductor Trade Statistics Organization (“WSTS”)**

8 234. Defendants also participate in the WSTS, a non-profit, which is the “source of
 9 semiconductor market data and forecasts.” WSTS compiles monthly sales numbers for the
 10 semiconductor industry, including DRAM, and provides twice-yearly semiconductor industry
 11 forecasts with quarterly and annual projections. A subscription to the WSTS Database also includes
 12 statistics on Semiconductor Capacity Utilization (known as SICAS Reports). WSTS is primarily
 13 funded by membership fees of participating semiconductor companies, whose representatives form
 14 the WSTS Committee. The members of this Committee submit accurate and authentic monthly
 15 revenue data, attend regional meetings, and contribute to the generation of world semiconductor
 16 industry forecasts.

18 235. Semiconductor companies may become WSTS members. Membership both
 19 comprises the obligation to feed the member company’s revenue data regularly into the appointed
 20 Data Collection Agents and fund the operation and services of WSTS by membership fees.
 21 Reciprocally, “Members have access to all Information Services that WSTS provides.” . . .
 22 “Semiconductor companies that are unable to report revenue data into the WSTS statistics programs
 23 (e.g., if they are not shipping any semiconductor products that generate revenues in any one of the
 24 recognized WSTS product categories) may obtain access to WSTS Information as Subscribers with
 25 WSTS.
 26
 27
 28

1 236. All three Defendants have been members of WSTS. Micron is a member of the
2 Americas Regional Group, and Samsung and SK Hynix are members of the Asia Pacific Regional
3 Group.

4 237. Several partners support WSTS in the operation of market statistics information
5 services. Data Collection Agents (“DCAs”) receive the revenue data from WSTS member companies
6 and keep this data under their custody. WSTS has appointed regional DCAs who collect revenue data
7 from member companies and consolidate this data into the regional base report. Regional DCAs
8 forward the regional base report at defined dates to the worldwide DCA. The worldwide DCA
9 consolidates all the data of the regional base reports and merges this data with non-participant
10 estimates that are provided by WSTS. DCAs also have the responsibility to check the submitted data
11 for completeness, consistency, and plausibility. They will resolve any perceived data anomalies with
12 the submitting member companies. Finally the worldwide DCA posts these data compilations under
13 the name of the various market statistics reports on the WSTS Internet Portal.

14 238. In its promotional materials, the WSTS notes that the membership gives “exclusive
15 access to the only source of market figures collected directly from semiconductor companies.” The
16 materials explain how information is collected from members: “Individual member companies enter
17 unit sales and revenue data into a simple online form on a monthly (in some cases quarterly) basis.”

18 239. Semiconductor Industry Associations in the different regions closely cooperate with
19 WSTS. In most cases they also hold distribution licenses for WSTS market statistic reports and
20 forecasts to serve interested parties outside the WSTS membership with their information needs.

21 240. In addition, the WSTS holds meetings for its members. For example, as explained on
22 a meeting registration page, “each WSTS Member Company has one official representative in the
23 Committee, who is expected to participate in the Committee Meeting.” Participation in the Forecast
24 Meeting is subject to the submission of a pre-meeting forecast. The process includes companies
25
26
27
28

1 submitting their forecast information and then publication of the pre-meeting average forecast to all
2 participating companies.

3 241. WSTS describes the value of its regular meetings as “an important venue for members
4 to help shape forecasts and future reports, and to interact with their industry peers. . . . Members are
5 able to exchange experiences with other market participants, gain important information about
6 current market sentiment, and hear directly from their peers how they view the future direction of the
7 market.”
8

9 242. WSTS holds a number of different types of meetings for members, including: Board
10 of Directors Meetings (at least twice a year); Executive Committee Meetings, including the World
11 Chairman and the five Regional Chairs (at least twice a year); Working Group Meetings where
12 certain WSTS members gather in regional or sector-specific groups; Committee Meetings where
13 members’ primary focus is to review the current situation in the semiconductor market and to
14 formulate forecasts for the upcoming quarters and following two years (twice a year); and Regional
15 Chapter Meetings (two to four times per year).
16

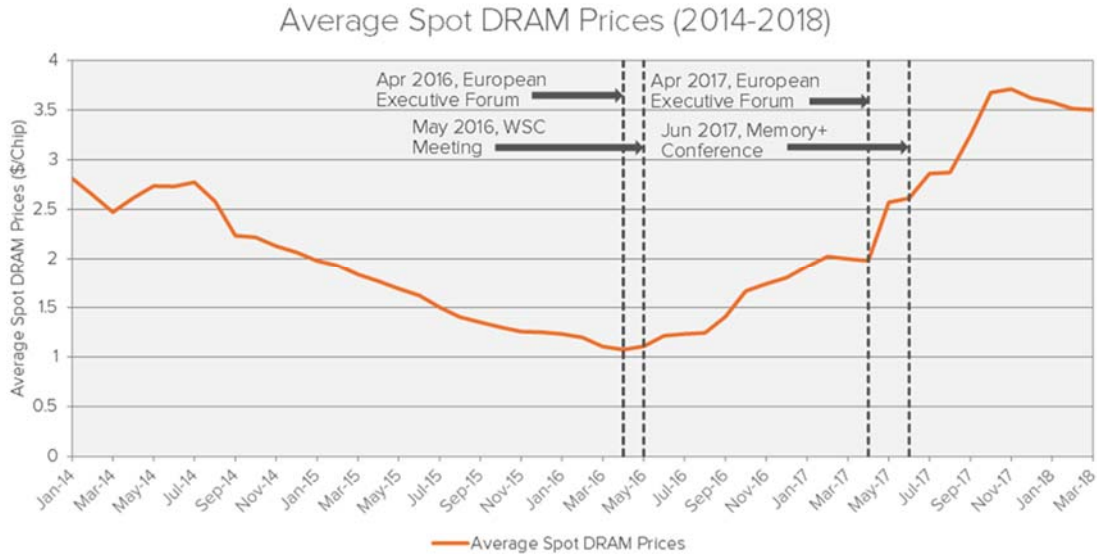
17 **6. Global Semiconductor Alliance (“GSA”)**

18 243. The GSA represents about 350 member companies, including Micron, Samsung, and
19 SK Hynix. The GSA holds a Memory Conference once every two years. For example, the conference
20 was held in March 2015 and June 2017. The GSA also holds an annual US Executive Forum
21 conference in September or October, an annual European Executive Forum in April, May, or June,
22 and an Annual Awards Dinner in December.
23

24 **B. Trade association meetings in which Defendants participated are correlated with price increases during the Class Period**

25 244. The graph below shows how average DRAM spot prices moved during the period
26 from January 2014 to the end of 2017. The price increase in May 2016 coincides with four trade
27
28

association meetings. Specifically, prices increased from one event to another, and can be seen close in time with key trade association meetings.



245. Notably, there was an increase in DRAM prices after the DRAM European Executive Forum in April 2016. The average monthly increase for DRAM from April 2016 to March 2018 is 5.6%, where before the Class Period (from March 2011 to March 2016), the average monthly increase for DRAM was -0.14%. Defendants' overlapping business relationships provide further opportunities for Defendants to collude. The chart below shows how during the Class Period prices increased after certain key meetings in April-May 2016 and April-May 2017.

The table below shows that DRAM prices have on an average increased after some of the key meetings held by industry associations:

Association	Event	Before Event Period	After Event Period	Average Monthly % Change in Prices (Positive Figure Implies Price Increase)	
				Before	After
GSA	European Executive Forum	Jan 2014 - Mar 2016	Apr 2016 - Mar 2018	-3.45	5.18
WSC	WSC Annual Meeting	Jan 2014 - Apr 2016	May 2016 - Mar 2018	-3.42	5.64
GSA	European Executive Forum	Jan 2014 - Mar 2017	Apr 2017 - Mar 2018	-0.70	5.70
GSA	Memory+ Conference	Jan 2014 - May 2017	Jun 2017 - Mar 2018	0.04	3.49

246. In addition to the transparency and ease of information sharing that comes from being in such as small industry where many of Defendants' employees likely know each other, Defendants also have overlapping business relationships with each other, which provide opportunities to exchange information and collude. For example, prior to joining Micron as its CEO in February 2017, Sanjay Mehrotra was President of SanDisk, a Flash Memory manufacturer. Starting in 2014, SanDisk and SK Hynix were involved in litigation against each other regarding a dispute over trade secrets. In August 2015, SanDisk announced that it had reached agreement with SK Hynix (led by CEO Sung Wook Park). As a result of the settlement, the two companies publicly announced intentions to modify and extend their intellectual property relationship and to enter into a multi-year commercial relationship under which SK Hynix agrees to supply DRAM products to SanDisk through 2023. Therefore, it is plausible that these two CEOs – Sung Wook Park and Sanjay Mehrotra knew each other through this effort.

C. Defendants Also Used Third Party Research Firms to Exchange Information in Furtherance of the Conspiracy

247. Plaintiffs already have discussed at length how CW 1 understood that Samsung at the beginning of the conspiracy in 2016 intentionally leaked information to Sean Muir and Cleveland Research to signal to its competitors (co-Defendants) that Samsung was raising DRAM prices.

248. CW 3, the former Hynix marketing executive, also has discussed how third party research firms were useful and expedient for exchanging information. One such firm is Gartner Research, which CW 3 stated would include industry trend information. CW 3 said these reports were critical for Hynix to understand the long-term volume for the entire industry and used such reports to assist in making major decisions, such as building another production plant. Gartner employees interviewed Hynix, Samsung, and Micron DRAM employees to write its reports. DRAM prices depended on supply and demand levels, and the Gartner reports frequently discussed forecasted supply levels.

IX. THE STRUCTURE OF THE DRAM INDUSTRY IS CONDUCTIVE TO CONSPIRACY

249. The structure and characteristics of the DRAM market are conducive to cartel behavior, and have made collusion particularly attractive in this market. The DRAM market has all of the hallmark features that are found in highly-cartelized markets, including: (1) DRAM is a commodity product; (2) the DRAM market is highly concentrated; (3) the DRAM market has high barriers to entry; (4) demand for DRAM is inelastic; and (5) the DRAM market experienced steep price increases during the Class Period, without any legitimate economic reason for those increases, such as increasing costs. There was also an ease of information sharing amongst Defendants through the industry reporting mechanism DRAMeXchange, as well as opportunities for Defendants to directly communicate and collude through common participation and leadership roles in trade associations and other industry groups.

1 **A. DRAM is a Commodity Product**

2 250. In economics, a commodity is a basic item or good used in commerce that is
3 interchangeable with other goods of the same type. Commodities are most often used as inputs in the
4 production of other goods or services. Examples of traditional commodities are sugar, wheat, and
5 rubber. As technologies for markets and goods mature, a product is more likely to be considered a
6 commodity, at least in its more basic implementations.
7

8 251. DRAM is a commodity. DRAM has been described as “like milk or bread,” and that it
9 “varies little from manufacturer to manufacturer.”

10 252. Markets for commodity products are conducive to collusion. Typically, when a
11 product is characterized as a commodity, competition is based principally on price, as opposed to
12 other attributes such as product quality or customer service. This factor facilitates coordination
13 because firms wishing to form a cartel can more easily monitor and detect defections from a price-
14 fixing agreement where any observed differences in prices are more likely to reflect cheating on the
15 conspiracy than any other factor which might affect pricing, such as special product characteristics,
16 service, or other aspects of the transaction.
17

18 253. The commodity nature of DRAM is aided by industry-standard product specifications.
19 The different sizes and classifications of DRAM are well known and easily quantifiable. Therefore,
20 DRAM can be purchased and sold in large volume quantities by manufacturers and distributors
21 based on common size and technology characteristics. Indeed, manufacturers and distributors
22 maintain very detailed product catalogs and substitution guides (sometimes called cross-reference
23 guides) that outline rules for swapping out DRAM made by other Defendants based on their common
24 characteristics.
25
26
27
28

1 **B. The DRAM Market is Highly Concentrated**

2 254. Market concentration facilitates collusion. Collusive agreements are easier to
3 implement and sustain when there are only a few firms controlling a large portion of the market.
4 Practical matters, such as coordinating cartel meetings and exchanging information, are much
5 simpler with a small number of players. Moreover, this high degree of control also simplifies
6 coordination because there is little outside competitive presence to undermine the cartel, and it is
7 easier for cartel participants to monitor each other's actions related to supply and pricing. Also, with
8 fewer firms in the market, the bump in transitory profits that could be achieved by undercutting the
9 cartel price and gaining an increase in transitory market share would be outweighed by the greater
10 long-term market share for a colluding firm in a concentrated industry.
11

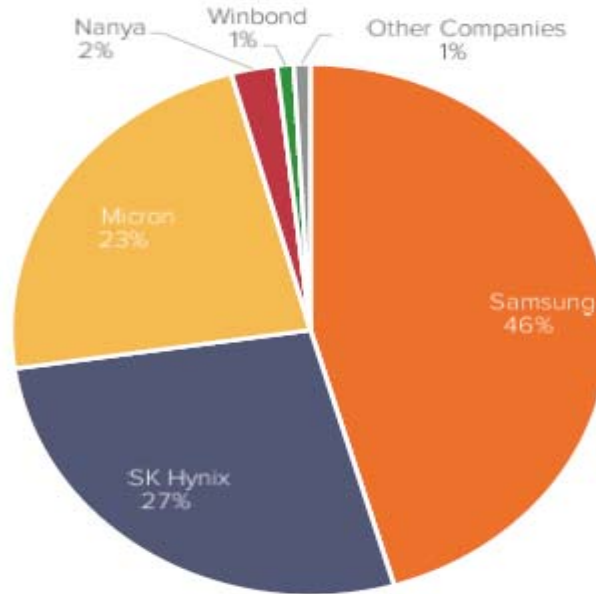
12 255. By contrast, if an industry is divided into a large number of small firms, the current
13 gain from cheating on a cartel (profits from sales captured from other cartel members through
14 undercutting of the cartel-fixed price in the current time period, which risks causing the cartel to fall
15 apart in the future) is large relative to the firm's possible gains from the cartel's continuing future
16 success (the firm's future share of the total cartel profits if collusion were to continue successfully).
17

18 256. In the 1980s, there were over 20 DRAM manufacturers. By 2012, that number had
19 dropped to fewer than 11 manufacturers. Several factors, such as weak demand for consumer
20 electronic products due to the great financial crisis during 2008 to 2012, as well as natural disasters,
21 curtailed supply of hard disk drives and, as a result, caused a slowdown in the memory market, and
22 caused DRAM makers to either go out of business or to be acquired by other companies.
23

24 257. The DRAM market is highly concentrated. As of March 2018, the DRAM market was
25 dominated by *only three main players* – Defendants Micron, Samsung, and SK Hynix. These
26 companies collectively control the lion's share of these markets, and have existed in the market
27 together for years.
28

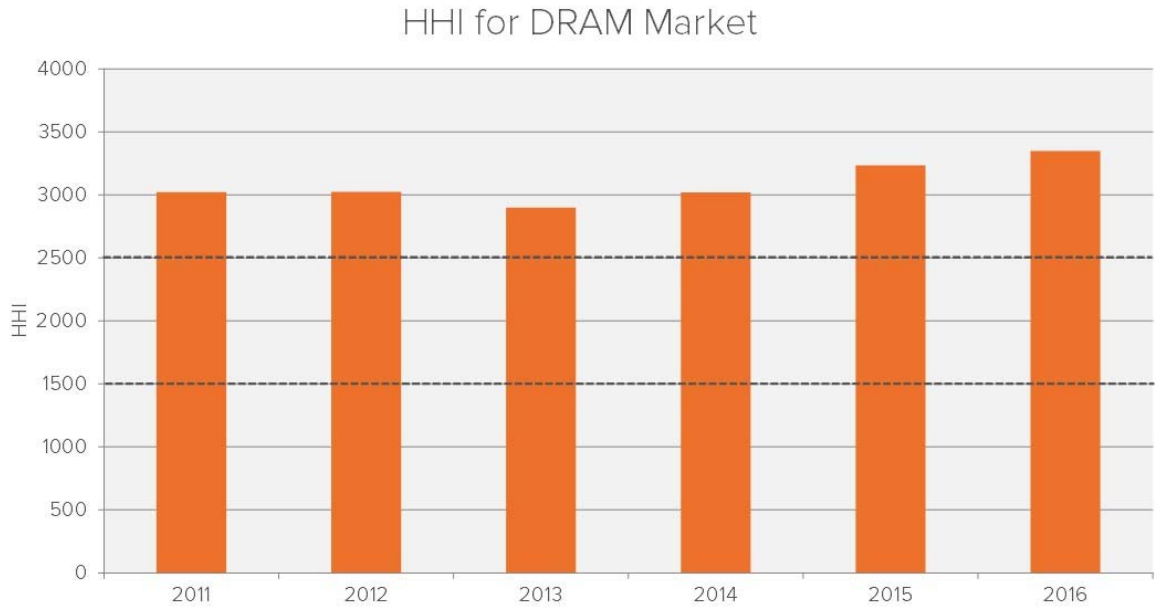
258. As of March 2018, Defendants collectively accounted for 96% of worldwide DRAM market share. Samsung held 46% of worldwide DRAM market share. SK Hynix held 27% of worldwide DRAM market share. Micron held 23% of worldwide DRAM market share. A handful of other manufacturers made up the other 4% of worldwide market share.

DRAM Market Share (2017 Quarter 2)



Source: Bloomberg

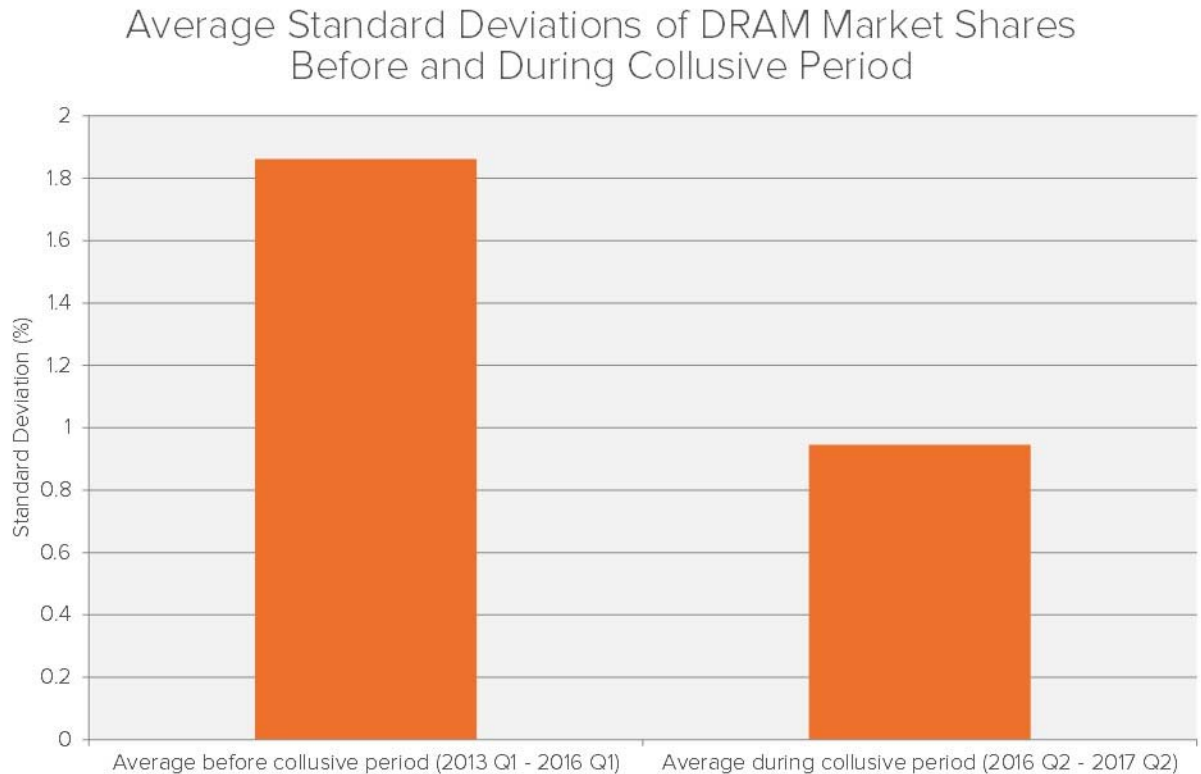
259. The Herfindahl-Hirschman index (“HHI”) is a commonly accepted measure of market concentration. The DOJ considers markets in between 1,500 to 2,500 to be moderately concentrated whereas anything in excess of 2,500 points is considered highly concentrated. The DRAM market HHI has been increasing over time as a result of industry consolidation and, by 2016, was 3,300.



Source: Bloomberg.

260. A highly concentrated market makes it easier for Defendants to facilitate their conspiracy by making it easier to make agreements, form understandings, combinations or conspiracies to fix, raise, maintain, and/or stabilize prices, and/or to allocate market shares, and to set and keep prices at artificially high, supra-competitive levels. In fact, throughout the Class Period, Defendants collectively maintained high market shares, and prices for DRAM remained astonishingly high.

261. In addition, in a competitive market, market shares are expected to fluctuate as manufacturers compete and win customer business from one another. During the alleged Class Period, DRAM market shares were flatter than they had been in the previous period. Specifically, the average variation in the market shares decreased from almost 2%, prior to the Class Period, to less than 1% before and after Q2 2016, as shown in the chart below.



Source: Bloomberg.

C. The DRAM Market Has High Barriers to Entry

262. Barriers to entry are obstacles which prevent new competitors from easily entering the market. They restrict competition in a market and may make it easier for incumbents to collude.

263. A collusive arrangement that raises product prices above competitive levels would, under basic economic principles, attract new entrants seeking to benefit from the supra-competitive pricing. Where, however, there are significant barriers to entry, new entrants are less likely to enter the market. Thus, barriers to entry help to facilitate the formation and maintenance of a cartel.

264. There are substantial barriers to entry that preclude, reduce, or make it more difficult for new entrants into the DRAM market. As one market observer lamented, “DRAM development requires huge investment and poses risk,” and it is hard for new entrants to enter the market.

1 **1. Defendants own the intellectual property for DRAM through cross-licenses,**
 2 **patents, and joint ventures**

3 265. The DRAM industry is also marked by a number of patents and partnerships between
 4 incumbents. A significant number of patents are cross-licensed among Defendants. Partnerships and
 5 alliances for technology and capacity further increase Defendants' market power and make it harder
 6 for a new entrant to enter the market.

7 266. Defendants own the patents for DRAM and enter into cross-license agreements with
 8 each other. In 2010, Micron signed a ten-year cross-license agreement with Samsung. Following this,
 9 in July 2013, Samsung and SK Hynix signed a cross-licensing contract according to which the
 10 companies share several chip-related patents.

11 267. Defendants repeatedly recognized the importance of holding the intellectual property
 12 rights as a way to fend off new entrants. For example, Micron's CFO noted at a June 5, 2017
 13 conference that the Defendants controlled important intellectual property and would not license it to
 14 potential Chinese entrants: the "real challenge is there is no source of IP other than the existing
 15 industry participants. And those industry participants I think are appropriately thoughtful about
 16 whether or not they want to license or otherwise share that IP with a potential new industry entrant.
 17 And in the absence of that IP I think, that the opportunity for China to successfully enter is
 18 significantly hampered."
 19

20 268. At a separate conference on June 15, 2017, Micron's CFO indicated that none of the
 21 Defendants would license their IP to a new entrant who would think differently about capacity than
 22 the Defendants: "if you look at every entrant into the memory business at some point in time, they
 23 had a legitimately sourced core of IP that allowed them to form the capability around which they
 24 have advanced their technology...[and] *the only IP holders in DRAM are the three industry*
 25 *participants and in various forms and flavors we have all indicated that we would be very*
 26
 27
 28

1 *challenged to think about transitioning that IP to someone who might think about industry*
 2 *capacity”* in an expansionary way.

3 269. Industry analysts have also commented on the threat of the Chinese entering the
 4 DRAM market, and have noted that even if the Chinese were able to develop advanced technology
 5 necessary to rival the Defendants on their own, the new Chinese suppliers would infringe on the
 6 numerous patents for DRAM that are held by Samsung, SK Hynix, and Micron (or other DRAM
 7 manufacturers).
 8

9 270. In 2017, Avril Wu, DRAMeXchange’s Research Director, commented that it was
 10 considerably difficult for Chinese startups to adopt the project design of DRAM, and without joint
 11 ventures or partnerships, it would be difficult for any Chinese new entrants to make a move on
 12 DRAM legally.
 13

14 271. In 2017, President Lee Pei-ing of Nanya Technology (“Nanya”), a smaller DRAM
 15 manufacturer, commented that it would take around three to five years for China to pose a threat to
 16 the existing memory industry.

17 **2. DRAM manufacturers have the benefit of economies of scale**

18 272. Economies of scale are cost advantages that arise due to scale of operation, with cost
 19 per unit of output decreasing with increasing scale of production. DRAM manufacturers have
 20 exhibited strong economies of scale through the following ways:
 21

- 22 • Technical Economies: These are cost savings that arise from increased use of
 23 large scale and specialist machinery, with strong technical capabilities. These
 24 requirements have created high barriers to entry in the DRAM market for the past
 25 20 years. Manufacturers are under constant pressure of decreasing process node
 26 size in order to meet increasing demand of memory density, and thereby reducing
 27 cost per bit of DRAM produced. From 2000 to 2016, manufacturers of DRAM
 28 have decreased the node size from 130 nm to 20 nm. Through this transition,

existing market players have built years of capability, enough to sustain development costs that are increasing by 13% annually. New entrants do not have the benefit of this integration.

- In addition, Defendants are vertically integrated firms – meaning that they participate in various levels of the supply chain. For example, Defendants not only make DRAM, but they produce various DRAM Devices in house (such as smartphones and tablets, etc.). By procuring their own materials, Defendants enjoy a cost advantage over potential new entrants who may not have such vertical integration arrangements.

273. The scale and technological requirements of producing DRAM memory products explain why there are so few players in the market, and how these aspects put potential entrants at a cost disadvantage. Between 2001 to date, no serious new DRAM competitors have emerged.

274. Micron CEO, Sanjay Mehtotra, has stated that in order to be a “meaningful player” in the memory segment (including DRAM), a few of the prerequisites for market players are: (1) leading-edge technology; (2) intellectual property; (3) large scale of production; and (4) higher quality products. He added that large global customers want to make sure that the product are designed to have proper intellectual property (“IP”) rights, which Chinese new entrants did not currently possess. These technological advancements are typically characterized by: (1) an increase in memory density (which can be achieved by reducing the die size, i.e., size of the chip, or the process node, i.e., the distance between transistors); (2) by an increase in speed of chip, i.e., the amount of data that can be transferred in a certain period of time; and (3) by a decrease in energy consumption, which can be done by reducing the operating current and voltage.

D. Demand for DRAM is Inelastic

275. “Elasticity” is a term used to describe the sensitivity of supply and demand to changes in one or the other. For example, demand is said to be “inelastic” if an increase in the price

1 of a product results in only a small decline in the quantity sold of that product, if any. In other words,
2 customers have nowhere to turn for alternative, cheaper products of similar quality, and so continue
3 to purchase despite a price increase.

4 276. For a cartel to profit from raising prices above competitive levels, demand must be
5 relatively inelastic at competitive prices. Otherwise, increased prices would result in declining sales,
6 revenues, and profits, as customers purchased substitute products or declined to buy altogether.
7 Inelastic demand is a market characteristic that facilitates collusion, allowing producers to raise their
8 prices without triggering customer substitution and lost sales revenue.
9

10 277. Demand for DRAM is highly inelastic because there are no close substitutes for
11 DRAM products. Because DRAM has no close substitutes, demand for DRAM will continue to rise
12 as new products requiring DRAM hit the market – such as the proliferation of smartphones and other
13 electronic devices. DRAM is the only type of memory that can serve as a substitute or functional
14 equivalent to DRAM in those products and devices. Accordingly, a purchaser of DRAM has no
15 choice but to be dependent on the few suppliers that exist – the Defendants.
16

17 278. The Defendants recognized the inelasticity of the DRAM market. At a December 6,
18 2017 investor presentation, Micron’s CFO emphasized the consensus view of the industry that the
19 DRAM market was inelastic: “there is a general belief that the industry participants are keenly aware
20 of the fact that the DRAM market is relatively inelastic.”
21

22 279. Micron’s CFO on December 7, 2016 also contrasted the DRAM market, which it
23 viewed as inelastic, against the NAND market, which it also competed in and viewed as much more
24 elastic: “our view is that the NAND market is much more price elastic than DRAM. So when DRAM
25 was at its lowest point, you didn’t see folks doubling down on the capacity of the PC and now the
26 DRAM has recovered, you don’t see folks having the capacity of the PC or a mobile phone.”
27
28

X. DEFENDANTS' PRIOR COLLUSION IN THE DRAM MARKET, AND RELATED MARKETS, MAKES COLLUSION EVEN MORE PLAUSIBLE HERE

A. Defendants Were Previously Convicted for Fixing Prices of DRAM

280. As discussed in the Part I, *supra*, this is not the first time Defendants stand accused of colluding in the DRAM market.

281. In 2005, the Department of Justice brought a criminal case against the same Defendants named here, and other DRAM manufacturers, for fixing prices of DRAM between April 1, 1999 and June 15, 2002. That action resulted in guilty pleas and jail time, and led to Defendants paying some of the largest criminal fines in history. The Defendants and their co-conspirators paid a collective \$731 million in criminal fines, and served a collective 3,185 days of jail time.

282. In November 2005, SEC and SSI – the same Samsung Defendants named herein – pleaded guilty to criminal charges brought by the DOJ, and agreed to pay a \$300 million criminal fine. The guilty plea admitted that between April 1, 1999 and June 15, 2002, Samsung conspired “to fix the prices of DRAM sold to certain computer and server manufacturers.” Affected customers included Dell, Compaq, Hewlett Packard, Apple, IBM, and Gateway. Samsung admitted during the sentencing hearing that in furtherance of the conspiracy, its officers and employees engaged in discussions and attended meetings with representatives of other DRAM manufacturers. During the period of the conspiracy, at least 48 Samsung officers and employees, including senior executives with final pricing authority had price-related contacts with employees of Defendant competitors, including Micron and Hynix.

283. In April 2006, a number of Samsung employees also entered individual guilty pleas, including Sun Woo Lee (SEC Senior Manager of DRAM sales), Yeongho Kang (SSI Associate Director of DRAM Marketing), and Young Woo Lee (Sales Director for SEC’s German subsidiary). Those guilty pleas covered various periods from as early as January 1, 1998 until on or about June 15, 2002, wherein those individuals conspired “to fix the prices of DRAM sold to certain computer

1 and server manufacturers in the United States.” Each employee was sentenced to pay a \$250,000 fine
2 and a prison sentence ranging from 7-10 months.

3 284. Il Ung Kim was general manager of memory marketing for Samsung during the prior
4 conspiracy. Il Ung Kim pleaded guilty to price fixing during the prior conspiracy period and received
5 the longest ever imprisonment for a foreign defendant charged with price fixing in the United States.
6 As part of his guilty plea, the DOJ stated that Kim had admitted “encouraging the involvement of
7 other Samsung employees in the DRAM conspiracy.”²⁶ During the prior conspiracy, Sewon Chun
8 worked from 2000 to 2002 in Samsung’s DRAM marketing team, which was supervised by Mr.
9 Kim. Following his release from prison, Mr. Kim is now president of SK Telecom, which is part of
10 the SK Group of companies that also includes SK Hynix.
11

12 285. Samsung employee Young Hwan Park (Vice President of Sales for SEC and President
13 of SSI) pleaded guilty in December 2006. This guilty plea covered the period April 1, 2001, until on
14 or about June 15, 2002, wherein Mr. Park conspired “to fix the prices of DRAM sold to certain
15 OEMs.” Mr. Park was sentenced to a \$250,000 fine and a 10-month prison sentence.
16

17 286. Sun Woo Lee, a Samsung executive, pleaded guilty in 2006 for participation in the
18 prior DRAM conspiracy. As part of the guilty plea, the DOJ stated that Mr. Lee had “participated in
19 the conspiracy by engaging in communications with representatives of other DRAM producers and
20 sellers, during which information on pricing was exchanged between competitors. That pricing
21 information was provided by Mr. Lee to his superiors knowing that at certain times it would be used
22 for the purpose and with the effect of influencing the price of DRAM sold to certain OEMs. Also
23 during these communications understandings were reached, the ultimate effect of which was to
24 stabilize and raise the price of DRAM sold to certain OEMs.” Following his guilty plea, Mr. Lee
25
26

27 ²⁶ *Sixth Samsung Executive Agrees to Plead Guilty to Participating in DRAM Price-fixing Cartel*,
28 *supra* note 9.

1 held various positions at Samsung, including President of Samsung Taiwan, President of Samsung
2 Germany, and from 2014-2015, President and Chief Executive Officer of Samsung Electronics
3 Europe.

4 287. In September 2006, Samsung employee Thomas Quinn (SSI Vice President of
5 Marketing for Memory Products) pleaded guilty “to fix[ing] the prices of DRAM sold to certain
6 OEMs.” Mr. Quinn was sentenced to pay a \$250,000 fine and serve an 8-month prison sentence.

7 288. In May 2005, SK Hynix (f/k/a Hynix Semiconductor, Inc.) pleaded guilty and was
8 fined \$185 million. The guilty plea covered the period April 1, 1999 to June 15, 2002, wherein
9 Hynix “conspired to fix the prices of DRAM to certain computer and server manufacturers.” Hynix
10 admitted that the affected customers included Dell, Compaq, Hewlett Packard, Apple, IBM, and
11 Gateway.
12

13 289. In the case against it by the DOJ, SK Hynix acknowledged that at least 15 of its
14 executives had contacts with competitors related to pricing in the DRAM market, which included
15 participating in meetings, conversations and communications to discuss the price of DRAM to be
16 sold to customers; agreeing with their competitors to charge prices of DRAM at certain levels to be
17 sold to certain customers; issuing price quotes in accordance with the agreements reached; and
18 exchanging information on sales in order to monitor and enforce their agreements. In particular,
19 C.K. Chung, the Director of World Wide Strategic Account Sales for Hynix, had pricing discussions
20 with his counterparts at Samsung both in person and on the phone and eventually pled guilty for his
21 participation in the conspiracy.
22

23 290. In March 2006, Hynix employees Dae Soo Kim (Hynix Senior Vice President and
24 General Manager of Worldwide Sales and Marketing), Chae Kyun Chung (Hynix Director of
25 Worldwide Strategic Account Sales), Kun Chul Suh (Hynix Senior Manager in Memory Products
26 Marketing), and Choon Yub Choi (General Manager for Marketing and Sales of Hynix’s German
27
28

1 subsidiary) entered individual guilty pleas for their participation in the DRAM conspiracy. Those
2 guilty pleas covered various periods from April 1, 2001, until on or about June 15, 2002, and
3 acknowledged that these individuals “conspired to fix the prices of DRAM to certain computer and
4 server manufacturers.” Affected customers included Dell, Compaq, Hewlett Packard, Apple, IBM,
5 and Gateway. Each of those individuals was fined \$250,000 and received prison sentences ranging
6 from five to eight months.
7

8 291. Gary Swanson, Senior Vice President of Memory Sales and Marketing at Hynix
9 Semiconductor America, was indicted in October 2006 for fixing DRAM prices in violation of
10 Section I of the Sherman Act.

11 292. Kun Chul Suh is currently CEO for SK Hynix America, Inc. Mr. Suh pleaded guilty
12 as part of the prior DRAM conspiracy. As part of his plea agreement, the DOJ stated that Mr. Suh
13 had “participated in the conspiracy by engaging in communications with representatives of other
14 DRAM producers and sellers, during which information on pricing was exchanged between
15 competitors with the effect of influencing the price of DRAM sold to certain OEMs. Also during
16 these communications understandings were reached, the effect of which was to stabilize and raise the
17 price of DRAM sold to certain OEMs. [Mr. Suh] also participated in the conspiracy by reporting
18 pricing information to his superiors with the knowledge that minimum pricing floors for the sale of
19 DRAM to certain OEMs in the United States would be set based on pricing information obtained by
20 him and other Hynix employees in communications with competitors. In addition, during the
21 relevant period [Mr. Suh] was aware of the existence of the conspiracy among the employees of
22 Hynix, and he knowingly consented to the participation of one or more of his subordinate employees
23 in that conspiracy.”
24

25 293. Choon Yub Choi, an executive at Hynix, pleaded guilty as part of the prior DRAM
26 conspiracy. Since his guilty plea, Mr. Choi held various positions at Hynix, including VP, managing
27
28

1 director at SK Hynix UK, and managing director at Hynix Semiconductor Deutschland GmbH until
2 January 2017. As part of his guilty plea, the DOJ stated that Mr. Choi had exchanged pricing
3 information with competitors, as well as knowingly consenting to the participation of other Hynix
4 employees in the conspiracy.

5
6 294. Dae Soo Kim, an executive at Hynix, pleaded guilty in 2006 as part of the prior
7 DRAM conspiracy. As part of his plea agreement, the DOJ stated that Mr. Kim “had participated in
8 this conspiracy by engaging in, and permitting his subordinates to engage in, communications with
9 representatives of certain other DRAM producers and sellers, during which information on pricing
10 was exchanged between competitors with the effect of influencing the price of DRAM sold to certain
11 OEMs. Also during these communications understandings were reached, the effect of which was to
12 stabilize and raise the price of DRAM sold to certain OEMs.” *While in jail, Hynix promoted Mr.*
13 *Kim in November 2007 to chief marketing officer at Hynix*, responsible for all semiconductor
14 sales and marketing. As of 2015, Mr. Kim was an advisor at Hynix. As part of his promotion, Jong
15 Gap Kim, the CEO of Hynix, stated that Hynix should ““make marketing a key growth engine as a
16 company-wide culture and “in order to accomplish that goal” Mr. Kim “will implement education
17 programs and strengthen market sensing capabilities.”

18
19 295. The following are examples of SK Hynix’s illegal behavior in the prior DRAM
20 conspiracy: (a) Hynix employee C.K. Chung collected pricing information from subordinates and
21 competitors and relayed that information to D.S. Kim; (b) Hynix employee Paul Palonsky, a
22 salesperson with responsibility for the IBM account, acknowledged in sworn testimony that he
23 gathered competitor price information “directly from competitors, including Samsung, Micron,
24 Infineon, Hitachi, Toshiba, Elpida, LG, and NEC”; (c) Hynix was aware of Samsung and Micron
25 prices before it submitted a bid to Apple in August 2001; and (d) also in 2001, a Hynix email refers
26
27
28

1 to the artificial product shortage created by Micron, and states that Micron will follow Samsung or
2 Hynix if Apple accepts a price increase.

3 296. Micron faced criminal prosecution by the DOJ as well. However, Micron was given
4 immunity from prosecution because it agreed to cooperate with the DOJ as part of the DOJ's
5 Antitrust Leniency Program.
6

7 297. Micron admitted its participation in the DRAM conspiracy as part of its cooperation
8 with the DOJ. In a sworn statement, Micron acknowledged that at least 31 of its executives and other
9 employees had conspiratorial contacts with other DRAM manufacturers, including Hynix and
10 Samsung, as well as other makers that were part of the market at that time, including Hitachi, Elpida,
11 NEC, Mosel Vitelic, Nanya, Winbond, and Toshiba, and admitted conspiratorial conduct with regard
12 to at least the following customers: Apple, Dell, Compaq, IBM, Gateway, Sun, Cisco, Thomson,
13 Seagate, Hewlett Packard, and Maxtor.
14

15 298. As part of the prior conspiracy, Micron employees and their counterparts at
16 competing DRAM manufacturers exchanged pricing information by telephone and in meetings.
17 Information exchanged in these discussions included prices to be charged to specific DRAM
18 customers, and at times, information about specific prices that they planned to charge their key
19 corporate accounts.
20

21 299. Micron executives also provided lengthy interviews to the government to obtain
22 individual amnesty and to discharge their cooperation obligations. Michael Sadler, Micron's Chief
23 Strategy Officer until December 2018, testified at the trial of Mr. Gary Swanson of Hynix, detailing
24 how the DRAM conspiracy was carried out. Mr. Sadler testified that he participated in a "worldwide
25 tour" to seek the cooperation of other manufacturers to restrict production. Mr. Sadler described this
26 trip to the DOJ as "slam-dunk" illegal, and acknowledged that he was an "originator of that idea."
27 Mr. Sadler also testified that he discussed pricing at two "core accounts" with Mr. Swanson, and that
28

1 those discussions “set a benchmark” for discussions with other customers. Based on their
2 discussions, Mr. Sadler concluded that he had an “understanding” with Mr. Swanson that Micron and
3 Hynix were “on the same page.” Mr. Sadler also testified that on one occasion, Mr. Swanson
4 confirmed to him that Hynix was going to raise certain prices and that Mr. Sadler responded
5 indicating that Micron would do the same.²⁷ Mr. Sadler was Chief Strategy Officer at Micron during
6 the Class Period and, as such, has close contact with individuals such as Micron’s CFO and CEO,
7 who are responsible for Micron’s DRAM operations, and who made the statements during earnings
8 calls that are alleged to have facilitated the conspiracy alleged herein.
9

10 300. Despite being given general immunity, one Micron executive, Regional Manager
11 Alfred Censullo, pleaded guilty to an obstruction of justice charge, whereby Mr. Censullo admitted
12 to having withheld and altered documents responsive to a grand jury subpoena served on Micron.
13 Mr. Censullo was sentenced to serve six months of home detention.
14

15 **1. Prior DRAM - Other Regulators**

16 301. The DOJ was not the only regulator to prosecute Defendants for participation in the
17 prior DRAM conspiracy.

18 302. On October 19, 2011, Samsung was fined €145,727 million by the European
19 Commission (“EU”) for its role in fixing prices as part of a DRAM conspiracy between July 1, 1998
20 and June 15, 2002. Samsung received a reduction in its fines for acknowledging the cartel to EU
21 investigators. The EU also fined Micron for its role in the same price-fixing conspiracy. However,
22 Micron avoided payment as a result of being the first firm to reveal the cartel to investigators, and for
23 its cooperation with the EU regulatory body.
24
25
26
27

28 ²⁷ Transcript of Record, *U.S. v. Swanson*, No. 3:06-00692 PJH (N.D. Cal. Feb. 12, 2008).

1 303. In 2002, the Canadian authorities also began an investigation into price-fixing in the
2 DRAM market. Due to the recession, Canadian authorities put the investigation on hold. However,
3 the investigation resumed on or about 2014 (after the EU investigation and case had concluded).
4 After presenting evidence to Samsung and the other DRAM makers, Samsung and the other
5 companies agreed to a \$120 million settlement agreement, with a \$40 million fine, and \$80 million to
6 be paid back to Canadians who purchased computers (laptops or desktops), printers, memory
7 modules, graphics cards, video game consoles, DVD players, personal digital assistants, MP3
8 players, personal video recorders, servers, computer based point of sale systems, or any other
9 products containing DRAM between April 1, 1999 to June 30, 2002.
10

11 **2. Prior DRAM Civil Cases (Direct and Indirect)**

12 304. The same Defendants as named here were also named in prior civil litigations, which
13 alleged they participated in a conspiracy to fix prices of DRAM between 1999 and 2002. *See In Re*
14 *Dynamic Random Access Memory (DRAM) Antitrust Litig.*, Master File No. M:02-cv-01486-PJH
15 (N.D. Cal.). Settlements in those prior civil actions are among the largest civil price-fixing
16 settlements in history, with the direct purchaser action totaling over \$350 million in settlements, and
17 the indirect purchaser action totaling over \$310 million in settlements.
18

19 **B. Other Semiconductor Memory Products**

20 **1. SRAM**

21 305. Following on the heels of the prior DRAM criminal case investigation, and noting the
22 overlap of DRAM and SRAM makers and key executives, the DOJ launched an investigation of
23 price-fixing violations by Defendants (and others in the SRAM market).
24

25 306. Micron acknowledged the DOJ's SRAM investigation in its 2007 Form 10-K: "On
26 October 11, 2006, we received a grand jury subpoena from the U.S. District Court for the Northern
27
28

1 District of California seeking information regarding an investigation by the DOJ into possible
2 antitrust violations in the ‘Static Random Access Memory’ or ‘SRAM’ industry.”

3 307. Samsung was also part of the DOJ’s SRAM investigation. On October 13, 2006, the
4 DOJ announced that it had started the antitrust investigation, and that Samsung (SEC) had been
5 asked to submit related documents and pledged a full cooperation with the probe.
6

7 308. On November 1, 2006, CNet News reported that SEC, the world’s biggest maker of
8 memory chips, said its German offices were raided as part of a European Union probe into suspected
9 price-fixing of SRAM chips. “We were raided on Oct. 11 in connection with our SRAM products,” a
10 representative for Samsung Germany said Wednesday. “We are cooperating in full with the
11 investigation.” The European Commission said Tuesday it had raided the offices of several makers
12 of SRAM chips in Germany, suspecting price-fixing in the sector.
13

14 309. From IDG News Service, October 31, 2006: “The U.S. Department of Justice probe
15 into the SRAM (static RAM) chip market appears to be widening. Sony Corp. said Tuesday that its
16 U.S. unit, Sony Electronics Inc., has received a subpoena from the DOJ seeking information on its
17 SRAM business. In a brief statement the company said it will cooperate with the request. Earlier this
18 month, four other SRAM companies said they had also been contacted by the DOJ. They are Cypress
19 Semiconductor Corp., which was first to announce it had been contacted, and the U.S. units of
20 Mitsubishi Electric Corp., Samsung Electronics Co. Ltd. and Toshiba Corp.”
21

22 **2. Flash**

23 310. On or about September 2007, the DOJ confirmed that it was investigating potential
24 antitrust violations by Samsung (SEC and SSI), SK Hynix and others for price-fixing in the Flash
25 memory market. Samsung was among the entities that received grand jury subpoenas in connection
26 with the investigation. *In re Flash Memory Antitrust Litig.*, 643 F. Supp. 2d 1133, 11400 (N.D. Cal.
27 Mar. 31, 2009) (*Flash MTD Order*).
28

311. In 2012, Samsung and SK Hynix settled claims alleging that they conspired with SanDisk Corp. and other makers to fix prices on flash memory through unlawful patent licensing deals and other misconduct. The underlying suit, which was first filed in 2007, alleged that the *Flash* defendants engaged in illegal meetings with each other with the intent to boost the price of Flash memory products that were used in digital cameras, flash drives, portable music players, and other electronic devices. *In re: Flash Memory Antitrust Litigation*, case number 4:07-cv-00086, in the U.S. District Court for the Northern District of California.

XI. EFFECTS OF DEFENDANTS' MISCONDUCT

A. The Inflated Prices for DRAM Caused by Defendants' Anticompetitive Conduct Were Passed on to Consumers who Purchased DRAM Devices.

312. Defendants' anticompetitive behavior resulted in harm to Plaintiffs and other members of the proposed Classes because it caused them to pay higher prices for DRAM Devices (the identified list of products in the Class definitions, *see infra*, Part XII), which contain DRAM, than they would have otherwise paid if not for Defendants' anticompetitive business practices. The entire overcharge (supra-competitive price) for DRAM was caused by Defendants' anticompetitive conduct and that supra-competitively-priced DRAM and its supra-competitive price was passed on through the distribution chain to cause supra-competitive prices for DRAM Devices purchased by consumers, which overcharges are traceable to the overcharges on DRAM.

313. As explained in Section IX.A, DRAM is a commodity product with standard specifications. It has all of the characteristics of a commodity product, including product uniformity, fungibility (interchangeability), a large number of (direct and indirect) buyers, and it is sold in global market. Indeed, as explained previously, including DRAM manufactured by Defendants, conforms to standards that are established by the JEDEC, in areas such as features, functionality, AC and DC parametric values, and packages and parametric values. Critically, that Defendants and other DRAM manufacturers have conformed to these standards ensures product uniformity across all

1 manufacturers and thus, interchangeability. As CW 3 explained, “It’s a maximum commodity
2 approach.” The commodity nature of DRAM, and in particular the interchangeability of DRAM
3 between manufacturers, including Defendants, facilitated the collusion and also increased the
4 likelihood of the pass-through of the overcharge caused by the collusion through the distribution
5 chain to the prices for DRAM Devices.
6

7 314. DRAM is incorporated into a variety of electronic consumer products, including
8 computers and phones, which are also commodity products. DRAM remains essentially unchanged
9 when it is incorporated into a DRAM Device. When DRAM is purchased as part of a DRAM
10 Device, it is a distinct, physically discrete element of the end-use product that does not undergo
11 physical alterations as it moves through the distribution chain, and it is identifiable by a specific,
12 discrete part or model number that permits tracing to Defendants. As a result, DRAM follows a
13 traceable physical chain of distribution from the Defendants to Plaintiffs and members of the
14 Classes, and any costs attributable to DRAM can be traced through the chain of distribution to
15 Plaintiffs and members of the Classes.
16

17 315. Plaintiffs and the indirect purchaser classes they represent are purchasers of specific
18 kinds of devices containing DRAM, namely cell phones, computers, tablets, network servers,
19 graphics processing units (“GPUs”), and computer memory products.
20

21 316. As discussed in more detail in Section IV.E, *supra*, DRAM and the market for the
22 DRAM Device products into which they are placed are inextricably linked and intertwined, including
23 but not limited to because DRAM makes up a substantial component cost of DRAM Devices. The
24 retail price of a DRAM Device is determined in substantial part by the cost of the DRAM it contains.
25

26 317. Indirect purchasers purchased DRAM Devices containing DRAM either from (1) an
27 OEM manufacturer of products containing DRAM, or (2) a reseller, such as a retailer or wireless
28 network. As discussed in Section IV.E, these markets contain identifiable entities and are

1 concentrated. Defendants' revenues from DRAM follow a traceable chain from Defendants to the
2 consumer.

3 318. Indeed, the OEM and retail markets for DRAM Devices are subject to vigorous price
4 competition. The direct purchaser OEMs and retailers have very thin net margins. They are therefore
5 at the mercy of their component costs, such that increases in the price of DRAM lead to quick,
6 corresponding price increases at the OEM and retail levels for DRAM and DRAM Devices.

7
8 319. The precise amount of the overcharge impacting the prices of DRAM and DRAM
9 Devices can be measured and quantified. Commonly used and well-accepted economic models can
10 be used to measure both the extent and the amount of the supra-competitive charge passed-through
11 the chain of distribution. Economists have developed techniques to isolate and understand the
12 relationship between one "explanatory" variable and a "dependent" variable in those cases when
13 changes in the dependent variable are explained by changes in a multitude of variables, even when
14 all such variables may be changing simultaneously. That analysis – called regression analysis - is
15 commonly used in the real world and in litigation to determine the impact of a price increase on one
16 cost in a product (or service) that is an assemblage of costs. Thus, it is possible to isolate and identify
17 only the impact of an increase in the price of DRAM prices for DRAM Devices, even though such
18 products contain a number of other components whose prices may be changing over time. A
19 regression model can explain how variation in the price DRAM affects changes in the price of
20 DRAM Devices. In such models, the price of DRAM would be treated as an independent or
21 explanatory variable. The model can isolate how changes in the price of DRAM impact the price of
22 DRAM Devices while controlling for the impact of other price-determining factors. Thus, the
23 economic harm to Plaintiffs and class members can be quantified.

24
25
26 320. Economic theory teaches that the only situations in which precisely zero pass through
27 occurs is when an industry faces a perfectly elastic demand for its product (i.e., the price was fixed,
28

1 with demand dropping to zero with an infinitesimal price increase, and expanding infinitely if price
 2 were to drop infinitesimally), or if supply was perfectly inelastic (i.e., if even a very large increase in
 3 price for a product was incapable of stimulating additional supply).²⁸ These possibilities are
 4 considered implausible by economists. Either scenario is at odds with the nature of the device
 5 industries. Existing empirical studies of the electronics industry have concluded that demand is *not*
 6 infinitely elastic. Therefore, at least a partial pass through of an increase in the costs of DRAM into
 7 the price of DRAM Devices – and consequent harm to class members – is the predicted outcome of
 8 successful cartel behavior.
 9

10 321. To the extent that distributors, wholesalers, and retailers selling to consumers or to
 11 others in the distribution chain price their sales as their cost plus a fixed markup, this will create an
 12 additional reason for pass through to exceed 100 percent through these channels.²⁹ Further, because
 13 retailers ultimately compete with direct sales to purchasers by device manufacturers, competitive
 14 forces would likely work to equalize end-purchaser prices between channels, after controlling for the
 15 value of differences in support across different distribution channels. This would tend to push the
 16 total pass-through rate from costs to end-purchaser pricing above 100 percent, since manufacturers
 17 could not sustain a pricing policy to distributors that did not cover their costs, and an additional fixed
 18 markup on top of distributor cost would result in a total pass-through rate to final consumers in
 19 excess of 100 percent.
 20
 21

22 322. Thus, the extent to which input cost increases are passed through into output prices is
 23 entirely an empirical issue, and it is an area in which methods of empirical analysis are well
 24

25 ²⁸ The usual hypothesis that is commonly examined in empirical pass through studies is whether
 pass through exceeds, falls short of or equals 100 percent.

26 ²⁹ For example, if a wholesaler prices its product at manufacturer sales price plus 10 percent, and
 27 a retailer prices its product at wholesale plus 10 percent, the total pass through to the final consumer
 28 will be 121 percent (i.e., 110 percent times 110 percent) of manufacturer sales price. Certain
 distributor costs, like the costs of holding inventory, and “shrinkage,” may be approximately
 proportional to the value of the products held, and thus be one factor creating this pricing policy.

1 established. Based on both theory and the published studies in this area, it is likely that the pass-
2 through rates of inflated costs on DRAM will exceed 100 percent, a situation known as
3 “overshifting.”

4 323. In particular, it is undisputed that overshifting is possible in markets with many
5 suppliers of differentiated products and easy entry and exit, an environment known as “monopolistic
6 competition.” Indeed, pass through in excess of 100 percent would actually be expected in industries
7 where firms produce differentiated products in competitive conditions, and face economies of scale –
8 that is, where their average cost of producing a product declines with their level of output. In
9 particular, as noted next, in competitive industries with differentiated products and relatively easy
10 entry and exit (monopolistic competition), when there are economies of scale, overshifting will be
11 the rule, not the exception. Empirical studies by economists have characterized the personal
12 computer industry as an industry which fits this description. For this reason, it is likely that pass
13 through is greater than 100 percent, in the market conditions that prevail for most, if not all, types of
14 mass market computer and consumer electronics equipment, which includes all of the DRAM
15 Devices.

16 324. As a result, the inflated prices of DRAM Devices resulting from Defendants’
17 anticompetitive practices have been passed on to the Plaintiffs and other members of the proposed
18 classes by direct-purchaser manufacturers, distributors, and retailers.

19 325. Thus, Plaintiffs and other members of the proposed Classes have been forced to pay
20 supra-competitive prices for DRAM Devices. These inflated prices have been passed on to them by
21 direct purchaser manufacturers, distributors, and retailers, injuring Plaintiffs in a manner that is
22 traceable through the distribution chain to the supra-competitive prices for DRAM caused by
23 Defendants’ collusion. The precise amount of the overcharge impacting the prices of DRAM and
24 DRAM Devices can be measured and quantified. Commonly used and well-accepted economic
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models can be used to measure both the extent and the amount of the supra-competitive charge passed-through the chain of distribution. Thus, the economic harm to Plaintiffs and class members can be quantified.

XII. CLASS ACTION ALLEGATIONS

326. Plaintiffs bring this action under Federal Rule of Civil Procedure 23(b)(2) and 23(b)(3) on their own behalf and on behalf of the following class (the “Class”) for injunctive relief under federal law:

All persons and entities residing in the United States who purchased, paid, and/or provided reimbursement for some or all of the purchase price for DRAM Devices (“DRAM Devices”) from June 1, 2016 through February 1, 2018. DRAM Devices for the purpose of this definition means personal computers, network servers, cellular phones, tablets, computer graphical processing units, and computer DRAM memory products. This class excludes the Defendants; the officers, directors or employees of the Defendants; and any subsidiary, affiliate or other entity in which Defendants have a controlling interest. The Class also excludes all federal, state or local governmental entities, all judicial officers presiding over this action and their immediate family members and staff, and any juror assigned to this action.

327. Plaintiffs also seek certification of the following subclass (“Subclass”) under Rule 23(b)(3) for damages, under the laws of the Indirect Purchaser States (as defined below), in addition to certification of the Class under Rule 23(b)(2) for purposes of injunctive relief:

All persons and entities residing in the United States who purchased, paid, and/or provided reimbursement for some or all of the purchase price for DRAM Devices (“DRAM Devices”) from June 1, 2016 through February 1, 2018. DRAM Devices for the purpose of this definition means personal computers, network servers, cellular phones, tablets, computer graphical processing units, and computer DRAM memory products. This class excludes the Defendants; the officers, directors or employees of the Defendants; and any subsidiary, affiliate or other entity in which Defendants have a controlling interest. The Class also excludes all federal, state or local governmental entities, all judicial officers presiding over this action and their immediate family members and staff, and any juror assigned to this action.

328. Plaintiffs will seek certification of the following subclasses (collectively, the “State Classes”) for damages for claims under the antitrust statutes and/or consumer protection statutes of each of the following jurisdictions:

- a. **District of Columbia class:** All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in the District of Columbia during the Class Period.
- b. **Iowa class:** All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Iowa during the Class Period.
- c. **Kansas class:** All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Kansas during the Class Period.
- d. **Minnesota class:** All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Minnesota during the Class Period.
- e. **Mississippi class:** All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Mississippi during the Class Period.
- f. **Missouri class:** All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Missouri during the Class Period.
- g. **New Mexico class:** All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in New Mexico during the Class Period.
- h. **New York class:** All persons and who indirectly purchased DRAM from Defendants or co-conspirators for personal use in New York during the Class Period.

- i. **Oregon class**: All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Oregon during the Class Period.
- j. **Tennessee class**: All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Tennessee during the Class Period.
- k. **Utah class**: All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Utah during the Class Period.
- l. **Virginia class**: All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Virginia during the Class Period.
- m. **Wisconsin class**: All persons and entities who indirectly purchased DRAM from Defendants or co-conspirators for personal use in Wisconsin during the Class Period.

329. Common questions of law and fact exist as to all members of the Class and State Classes. Such questions of law and fact common to the Class and State Classes include, but are not limited to, the following:

330. Whether Defendants engaged in collusive conduct in the DRAM market, including restrictions on the growth of DRAM supply.

331. Whether Defendants' unlawful conduct enabled Defendants to increase, maintain, or stabilize above competitive levels the prices they charge for DRAM; if so, whether such supra-competitive prices were passed on to Class and State Class members; and, if so, the appropriate classwide measure of damages.

332. Whether Defendants violated Section 1 of the Sherman Act.

333. Whether Defendants violated the antitrust, unfair competition, consumer protection laws, and unjust enrichment laws, as alleged below.

334. These common questions and others predominate over questions, if any, that affect only individual Class or State Class members. Fed. R. Civ. P. 23(a)(2) and 23(b)(3).

335. Plaintiffs' claims are typical of, and not antagonistic to, the claims of the other Class members. By advancing their claims, Plaintiffs will also advance the claims of all Class members, because Defendants participated in activity that caused all Class members to suffer similar injuries. Fed. R. Civ. P. 23(a)(3).

336. Plaintiffs will fairly and adequately protect the interests of absent Class members. There are no material conflicts between Plaintiffs' claims and those of absent Class or State Classes' members that would make class certification inappropriate. Counsel for Plaintiffs are experienced in complex class action litigation, including antitrust litigation, and will vigorously assert Plaintiffs' claims and those of absent Class and State Class members. Fed. R. Civ. P. 23(a)(4).

337. A class action is superior to other methods for the fair and efficient resolution of this controversy. The class action device presents fewer management difficulties, and provides the benefit of a single adjudication, economy of scale, and comprehensive supervision by a single court. Fed. R. Civ. P. 23(b)(3). The damages suffered by each Plaintiff and each Class and State Class member is relatively small, given the expense and burden of individual prosecution of the claims asserted in this litigation. Thus, absent class certification, it would not be feasible for Plaintiffs and Class and State Class members to redress the wrongs done to them. Even if Plaintiffs and Class members could afford individual litigation, which is not the case, the court system could not. Further, individual litigation presents the potential for inconsistent or contradictory judgments and would greatly magnify the delay and expense to all parties and to the court system. Therefore, the class

1 action device presents far fewer case management difficulties and will provide the benefits of unitary
2 adjudication, economy of scale, and comprehensive supervision by a single court.

3 338. Defendants have acted or refused to act on grounds generally applicable to the Class
4 and State Classes, thereby making appropriate final injunctive relief or corresponding declaratory
5 relief with respect to the Class as a whole. Fed. R. Civ. P. 23(b)(2).
6

7 **XIII. VIOLATIONS ALLEGED**

8 **FIRST CLAIM FOR RELIEF**

9 **Violations of Sherman Act, 15 U.S.C. § 1**

10 339. Indirect Purchaser Plaintiffs incorporate by reference all the above allegations as if
11 fully set forth herein.

12 340. Beginning at least as early as June 1, 2016, the exact date being unknown to Indirect
13 Purchaser Plaintiffs and exclusively within the knowledge of Defendants, Defendants and their co-
14 conspirators entered into a continuing contract, combination, or conspiracy to unreasonably restrain
15 trade and commerce in violation of Section 1 of the Sherman Act (15 U.S.C. § 1) by artificially
16 reducing or eliminating competition in the United States.
17

18 341. In particular, Defendants have combined and conspired to raise, fix, maintain, or
19 stabilize the prices of DRAM Devices sold in the United States.

20 342. As a result of Defendants' unlawful conduct, prices for DRAM and DRAM Devices
21 were raised, fixed, maintained, and stabilized in the United States.

22 343. The contract, combination, or conspiracy among Defendants consisted of a continuing
23 agreement, understanding, and concerted action among Defendants and their co-conspirators.
24

25 344. For purposes of formulating and effectuating their contract, combination, or
26 conspiracy, Defendants and their co-conspirators did those things they contracted, combined, or
27 conspired to do, including:
28

- a. Communicating in writing and orally to fix prices of DRAM and DRAM products.
- b. Agreeing to manipulate prices and supply of DRAM and DRAM Devices sold in the United States in a manner that deprived direct and indirect purchasers of free and open competition.
- c. Making supply growth decisions in accordance with the agreements reached.
- d. Selling DRAM and DRAM Devices to customers in the United States at noncompetitive prices.
- e. Providing false statements to the public to explain increased prices for DRAM and DRAM products.

345. As a result of Defendants' unlawful conduct, Indirect Purchaser Plaintiffs and the other members of the Class have been injured in their businesses and property in that they have paid more for DRAM Devices than they otherwise would have paid in the absence of Defendants' unlawful conduct.

346. These violations are continuing and will continue unless enjoined by this Court.

347. Pursuant to Section 16 of the Clayton Act, 15 U.S.C. § 26, Indirect Purchaser Plaintiffs and the Nationwide Class seek the issuance of an injunction against Defendants, preventing and restraining the violations alleged herein.

XIV. VIOLATIONS OF STATE ANTITRUST LAWS

348. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the preceding paragraphs.

349. The following Second through Thirteenth Claims for Relief are pleaded under antitrust laws of each State of jurisdiction identified below, on behalf of the indicated class.

SECOND CLAIM FOR RELIEF

**Violation of the District of Columbia Antitrust Act
D.C. Code § 28-4501, *et seq.*
(On Behalf of the District of Columbia class)**

350. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

351. The Policy of District of Columbia Code, Title 28, Chapter 25 (Restraints of Trade) is to “promote unhampered freedom of commerce and industry throughout the District of Columbia by prohibiting restraints of trade and monopolistic practices.”

352. Indirect Purchaser Plaintiffs purchased DRAM within the District of Columbia during the Class Period. But for Defendants’ conduct set forth herein, the price of DRAM would have been lower, in an amount to be determined at trial.

353. Under District of Columbia law, indirect purchasers have standing to maintain an action under the antitrust provisions of the D.C. based on the facts alleged in this Complaint, because “any indirect purchaser in the chain of manufacture, production or distribution of goods...shall be deemed to be injured within the meaning of this chapter.” D.C. Code §28-4509(a).

354. Defendants contracted, combined or conspired to act in restraint of trade within the District of Columbia, and monopolized or attempted to monopolize the market for DRAM within the District of Columbia, in violation of D.C. Code §28-4501, *et seq.*

355. Plaintiffs and members of the Class were injured with respect to purchases of DRAM in the District of Columbia and are entitled to all forms of relief, including actual damages, treble damages, and interest, reasonable attorneys’ fees and costs.

THIRD CLAIM FOR RELIEF

**Violation of the Iowa Competition Law
Iowa Code §553.1, *et seq.*
(On behalf of the Iowa class)**

356. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

357. The Iowa Competition Law aims to “prohibit[] restraint of economic activity and monopolistic practices.” Iowa Code § 553.2.

358. Indirect Purchaser Plaintiffs purchased DRAM within the State of Iowa during the Class Period. But for Defendants’ conduct set forth herein, the price of DRAM would have been lower, in an amount to be determined at trial.

359. Defendants contract, combined or conspired to restrain or monopolize trade in the market for DRAM, and attempt to establish or did in fact establish a monopoly for the purpose of excluding competition or controlling, fixing or maintaining price for DRAM, in violation of Iowa Code § 553.1, *et seq.*

360. Plaintiffs and members of the Iowa Class were injured with respect to purchases of DRAM in Iowa, and are entitled to all forms of relief, including actual damages, exemplary damages for willful conduct, reasonably attorneys’ fees and costs, and injunctive relief.

FOURTH CLAIM FOR RELIEF

**Violation of the Kansas Restraint of Trade Act
Kan. Stat. Ann § 50-101, *et seq.*
(On Behalf of the Kansas Class)**

361. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

362. The Kansas Restraint of Trade Act aims to prohibit practices which, *inter alia*, “tend to prevent full and free competition in the importation, transportation or sale of articles and imported into this state.” Kan. Stat. Ann § 50-112.

369. Indirect Purchaser Plaintiffs purchased DRAM within the State of Minnesota during the Class Period. But for Defendants' conduct set forth herein, the price of DRAM would have been lower, in an amount to be determined at trial.

370. Under the Minnesota Antitrust Act of 1971, indirect purchasers have standing to maintain an action based on the fact alleged in this Complaint. Minn. Stat. §325D.56.

371. Defendants contracted, combined or conspired in unreasonable restraint of trade or commerce in the market for DRAM within the intrastate commerce of and outside of Minnesota; established, maintained, used or attempted to establish, maintain or use monopoly power over the trade or commerce in the market for DRAM within the intrastate commerce of and outside of Minnesota; and fixed prices and allocated markets for DRAM within the intrastate commerce of and outside of Minnesota, in violation of Minn. Stat. § 325D.49, *et seq.*

372. Plaintiffs and members of the Class were injured with respect to purchases of DRAM in Minnesota and are entitled to all forms of relief, including actual damages, treble damages, costs and disbursements, reasonable attorneys' fees, and injunctive relief necessary to prevent and restrain violations hereof.

SIXTH CLAIM FOR RELIEF

**Violation of the Mississippi Antitrust Statute,
Miss. Code Ann. § 74-21-1, *et seq.*
(On Behalf of the Mississippi Class)**

373. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

374. Title 75 of the Mississippi Code regulates trade, commerce and investments. Chapter 21 thereof generally prohibits trusts and combines in restraint or hindrance of trade, with the aim that “trusts and combines may be suppressed, and the benefits arising from competition in business [are] preserved” to Mississippians. Miss. Code Ann. § 75-21-39.

1 375. Trusts are combinations, contracts, understandings or agreements, express or implied,
2 when inimical to the public welfare and with the effect of, *inter alie*, restraining trade, increasing the
3 price or output of a commodity, or hindering competition in the production or sale of a commodity.
4 Miss. Code Ann. § 75-21-1.

5 376. Indirect Purchaser Plaintiffs purchased DRAM within the State of Mississippi during
6 the Class Period. But for Defendants' conduct set forth herein, the price of DRAM would have been
7 lower, in an amount to be determined at trial.

8 377. Under Mississippi law, indirect purchasers have standing to maintain an action under
9 the antitrust provisions of the Mississippi Code based on the facts alleged in this Complaint. Miss
10 Code Ann. § 75-21-9.

11 378. Defendants combined, contracted, understood and agreed in the market for DRAM, in
12 a manner inimical to public welfare, with the effect of restraining trade, increasing the price of
13 DRAM and hinder competition in the sale of DRAM, in violation of Miss. Code Ann. § 75-21-1(a),
14 et seq.

15 379. Defendants monopolized or attempted to monopolize the production, control or sale
16 of DRAM, in violation of Miss. Code Ann. §75-21-3, et seq.

17 380. Defendants' DRAM are sold indirectly via distributors throughout the State of
18 Mississippi. During the Class Period, Defendants' illegal conduct substantially affected Mississippi
19 commerce.

20 381. Plaintiffs and members of the Class were injured with respect to purchases of DRAM
21 in Mississippi and are entitled to all formed of relief, including actual damages and a penalty of \$500
22 per instance of injury.

SEVENTH CLAIM FOR RELIEF

**Violation of the Missouri Merchandising Practices Act,
Mo. Ann. Stat. § 407.010, *et seq.*
(On Behalf of the Missouri Class)**

382. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

383. Chapter 407 of the Missouri Merchandising Practices Act (the “MMPA”) generally governs unlawful business practices, including antitrust violations such as restraints of trade and monopolization.

384. Indirect Purchaser Plaintiffs purchased DRAM within the State of Missouri during the Class Period. But for Defendants’ conduct set forth herein, the price of DRAM would have been lower, in an amount to be determined at trial.

385. Under Missouri law, indirect purchasers have standing to maintain an action under the MPA based on the facts alleged in this Complaint. *Gibbons v. J. Nuckolls, Inc.*, 216 S.W.3d 667, 669 (Mo. 2007).

386. Defendants contracted, combined or conspired in restraint of trade or commerce of DRAM within the intrastate commerce of Missouri, and monopolized or attempted to monopolize the market for DRAM within the intrastate commerce of Missouri by possessing monopoly power in the market and willfully maintaining that power through agreements to fix prices, allocate markets and otherwise control trade, in violation of Mo. Ann. Stat. § 407.010, *et seq.*

387. Plaintiffs and members of the Missouri Class were injured with respect to purchases of DRAM in Missouri and are entitled to all forms of relief, including actual damages or liquidated damages in an amount which bears a reasonable relation to the actual damages which have been sustained, as well as reasonable attorneys’ fees, costs and injunctive relief.

EIGHTH CLAIM FOR RELIEF

**Violation of the New Mexico Antitrust Act,
N.M. Stat. Ann. §§ 57-1-1, *et seq.*
(On Behalf of the New Mexico Class)**

388. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

389. The New Mexico Antitrust Act aims to prohibit restraints of trade and monopolistic practices. N.M. Stat. Ann. 57-1-15.

390. Indirect Purchaser Plaintiffs purchased DRAM within the State of New Mexico during the Class Period. But for Defendants' conduct set forth herein, the price of DRAM would have been lower, in an amount to be determined at trial.

391. Under New Mexico law, indirect purchasers have standing to maintain an action based on the facts alleged in this Complaint. N.M. Stat. Ann. § 57-1-3.

392. Defendants contracted, agreed, combined or conspired, and monopolized or attempted to monopolize trade for DRAM within the intrastate commerce of New Mexico, in violation of N.M. Stat, Ann. § 57-1-1, *et. seq.*

393. Plaintiffs and members of the Class were injured with respect to purchases of DRAM in New Mexico and are entitled to all forms of relief, including actual damages, treble damages, reasonable attorneys' fees, costs, and injunctive relief.

NINTH CLAIM FOR RELIEF

**Violation of Section 340 of the New York General Business Law
(On Behalf of the New York Class)**

394. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

395. Article 22 of the New York General Business Law prohibits monopolies and contracts or agreements in restraint of trade, with the policy of encouraging competition or the free exercise of

1 any activity in the conduct of any business, trade or commerce in New York. N.Y. Gen. Bus. Law §
2 340(1).

3 396. Indirect Purchaser Plaintiffs purchased DRAM within the State of New York during
4 the Class Period. But for Defendants' conduct set forth herein, the price of DRAM would have been
5 lower, in an amount to be determined at trial.
6

7 397. Under New York law, indirect purchasers have standing to maintain an action based
8 on the facts alleged in this complaint. N.Y. Gen. Bus. Law § 340(6).

9 398. Defendants established or maintained a monopoly within the intrastate commerce of
10 New York for the trade or commerce of DRAM and restrain competition in the free exercise of the
11 conduct of the business of DRAM within the intrastate of New York, in violation of N.Y. Gen. Bus.
12 Law § 340, *et seq.*
13

14 399. Plaintiffs and members of the Class were injured with respect to purchases of DRAM
15 in New York and are entitled to all forms of relief, including actual damages, treble damages, costs
16 not exceeding \$10,000, and reasonable attorneys' fees.

17 **TENTH CLAIM FOR RELIEF**

18 **Violation of the Oregon Antitrust Law, 19 Or. Rev. Stat. §646.705, *et seq.* (On Behalf of the Oregon Class)**

20 400. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above
21 paragraphs as if fully set forth herein.

22 401. Chapter 646 of the Oregon Revised Statutes generally governs business and trade
23 practices within Oregon. Sections 705 through 899 thereof govern antitrust violations, with the
24 policy to "encourage free and open competition in the interest of the general welfare and economy of
25 the state." Or. Rev. Stat. § 646.715.
26
27
28

1 408. Defendants' conduct violated the Tennessee Trade Practice Act because it was an
2 arrangement, contract, agreement, or combination to lessen full and free competition in goods in
3 Tennessee, and because it tended to increase the prices of goods in Tennessee. Specifically,
4 Defendants' combination or conspiracy had the following effects: (1) price competition for DRAM
5 was restrained, suppressed, and eliminated throughout Tennessee; (2) prices for DRAM were raised,
6 fixed, maintained and stabilized at artificially high levels throughout Tennessee; (3) Plaintiffs and the
7 Tennessee Class were deprived of free and open competition; and (4) Plaintiffs and the Tennessee
8 Class paid supra-competitive, artificially inflated prices for DRAM.
9

10 409. During the Class Period, Defendants' illegal conduct had a substantial effect on
11 Tennessee commerce as DRAM were sold in Tennessee.
12

13 410. Plaintiffs and the Tennessee Class purchased DRAM within the State of Tennessee
14 during the Class Period. But for Defendants' conduct set forth herein, the price of DRAM would
15 have been lower, in an amount to be determined at trial. As a direct and proximate result of
16 Defendants' unlawful conduct, Plaintiffs and the Tennessee Class have been injured in their business
17 and property and are threatened with further injury.
18

19 411. Under Tennessee law, indirect purchasers (such as Plaintiffs and the Tennessee Class)
20 have standing under the Tennessee Trade Practice Acts to maintain an action based on the facts
21 alleged in this Complaint.
22

23 412. Plaintiffs and members of the Tennessee Class were injured with respect to purchases
24 of DRAM in Tennessee and are entitled to all forms of relief available under the law, including
25 return of the unlawful overcharges that they paid on their purchases, damages, equitable relief, and
26 reasonable attorneys' fees.
27
28

TWELFTH CLAIM FOR RELIEF

**Violation of the Utah Antitrust Act,
Utah Code Ann. §§ 76-10-911, *et seq.*
(On Behalf of the Utah Class)**

413. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

414. The Utah Antitrust Act aims to “encourage free and open competition in the interest of the general welfare and economy of this state by prohibiting monopolistic and unfair trade practices, combinations and conspiracies in restraint of trade or commerce...” Utah Code Ann. § 76-10-3102.

415. Indirect Purchaser Plaintiffs purchased DRAM within the State of Utah during the Class Period. But for Defendants’ conduct set forth herein, the price of DRAM would have been lower, in an amount to be determined at trial.

416. Under the Utah Antitrust Act, indirect purchasers who are either Utah residents or Utah citizens have standing to maintain an action based on the facts alleged in this Complaint. Utah Code Ann. § 76-10-3109(1)(a).

417. Defendants contracted, combined or conspired in restraint of trade or commerce of DRAM, and monopolized or attempted to monopolize trade or commerce of DRAM, in violation of Utah Code Ann. § 76-10-3101, *et seq.*

418. Plaintiffs and members of the Class who are either Utah residents or Utah citizens were injured with respect to purchases of DRAM in Utah and are entitled to all forms of relief, including actual damages, treble damages, costs of suit, reasonable attorneys’ fees, and injunctive relief.

THIRTEENTH CLAIM FOR RELIEF

**Violation of the Wisconsin Antitrust Act,
Wis. Stat. Ann. §133.01(1), *et seq.*
(On Behalf of the Wisconsin Class)**

419. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

420. Chapter 133 of the Wisconsin Statutes governs trust and monopolies, with the intent “to safeguard the public against the creation or perpetuation of monopolies and to foster and encourage competition by prohibiting unfair and discriminatory business practices which destroy or hamper competition.” Wis. Stat. § 133.01.

421. Indirect Purchaser Plaintiffs purchased DRAM within the State of Wisconsin during the Class Period. But for Defendants’ conduct set forth herein, the price of DRAM would have been lower, in an amount to be determined at trial.

422. Under Wisconsin law, indirect purchasers have standing under the antitrust provisions of the Wisconsin Statutes to maintain an action based on the facts alleged in this Complaint. Wis. Stat. 133.18(a).

423. Plaintiffs and members of the Class were injured with respect to purchases of DRAM in Wisconsin in that the actions alleged herein substantially affected the people of Wisconsin, with at least thousands of consumers in Wisconsin paying substantially higher prices for Defendants’ DRAM in Wisconsin.

424. Accordingly, Plaintiffs and members of the Class are entitled to all forms of relief, including actual damages, treble damages, costs and reasonable attorneys’ fees, and injunctive relief.

425. Defendants’ and their co-conspirators’ anticompetitive activities have directly, foreseeably and proximately caused injury to Plaintiffs and members of the Classes in the United States. Their injuries consist of: (1) being denied the opportunity to purchase lower-priced DRAM

1 from Defendants, and (2) paying higher prices for Defendants' DRAM than they would have in the
 2 absence of Defendants' conduct. These injuries are the type of the laws of the above states were
 3 designed to prevent, and flow from that which makes Defendants' conduct unlawful.

4 426. Defendants are jointly and severally liable for all damages suffered by Plaintiffs and
 5 members of the Classes.
 6

7 **XV. VIOLATIONS OF STATE CONSUMER PROTECTION LAWS**

8 427. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the preceding
 9 paragraphs.

10 428. The following Fourteenth through Twentieth Claims for Relief are pleaded under the
 11 consumer protection or similar laws of each State or Jurisdiction identified below, on behalf of the
 12 indicated class.

13 **FOURTEENTH CLAIM FOR RELIEF**

14 **Violation of the District of Columbia Consumer Protection Procedures Act, 15 D.C. Code § 28-3901, *et seq.* 16 (On Behalf of the District of Columbia Class)**

17 429. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above
 18 paragraphs as if fully set forth herein.

19 430. Indirect Purchaser Plaintiffs and members of the District of Columbia Class
 20 purchased DRAM for personal use.

21 431. By reason of the conduct alleged herein, Defendants have violated D.C. Code § 28-
 22 3901, *et seq.*

23 432. Defendants are "merchants" within the meaning of D.C. Code § 28-3901(a)(3).

24 433. Defendants entered into a contract, combination or conspiracy between two or more
 25 persons of restrain of, or to monopolize, trade or commerce in the DRAM market, a substantial part
 26 of which occurred within the District of Columbia.
 27
 28

434. Defendants established, maintained or used a monopoly, or attempted to establish a monopoly, of trade or commerce in the Relevant Markets, a substantial part of which occurred within the District of Columbia, for the purpose of excluding competition or controlling, fixing or maintaining prices in the market for DRAM.

435. Defendants' conduct was an unfair method of competition, and an unfair or deceptive act or practice within the conduct of commerce within the District of Columbia.

436. Defendants' unlawful conduct substantially affected the District of Columbia's trade and commerce.

437. As a direct and proximate cause of Defendants' unlawful conduct, Plaintiffs and members of the District of Columbia Class have been injured in their business or property and are threatened with further injury.

438. By reason of the foregoing, Plaintiffs and members of the District of Columbia Class are entitled to seek all forms of relief, including treble damages or \$1500 per violation (whichever is greater) plus punitive damages, reasonable attorneys' fees and costs under D.C. Code § 28-3901, *et seq.*

FIFTEENTH CLAIM FOR RELIEF

**Violation of the Minnesota Consumer Fraud Act,
Minn. Stat. § 325F.68, *et seq.*
(On Behalf of the Minnesota Class)**

439. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

440. By reason of the conduct alleged herein, Defendants have violated Minn. Stat. § 325F.68, et seq.

441. Defendants engaged in a deceptive trade practice with the intent to injure competitors and consumers through supra-competitive profits.

442. Defendants established, maintained, or used a monopoly, or attempted to establish a monopoly, of trade or commerce in the DRAM Market, a substantial part of which occurred within Minnesota, for the purpose of controlling, fixing, or maintaining prices in the DRAM Market.

443. Defendants' conduct was unfair, unconscionable, or deceptive within the conduct of commerce within the State of Minnesota.

444. Defendants' conduct, specifically in the form of fraudulent concealment of their horizontal agreement, created a fraudulent or deceptive act or practice committed by a supplier in connection with a consumer transaction.

445. Defendants' unlawful conduct substantially affected Minnesota's trade and commerce.

446. Defendants' conduct was willful.

447. As a direct and proximate cause of Defendants' unlawful conduct, the Plaintiffs and the members of the Minnesota Class have been injured in their business or property and are threatened with further injury.

448. By reason of the foregoing, the Plaintiffs and the members of the Minnesota Class are entitled to seek all forms of relief, including damages, reasonably attorneys' fees and costs under Minn. Stat. § 325F.68, et seq. and applicable case law.

SIXTEENTH CLAIM FOR RELIEF

Violation of the New Mexico Unfair Practices Act, N.M. Stat. Ann. §§ 57-12-3, et seq. (On Behalf of the New Mexico Class)

449. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

450. By reason of the conduct alleged herein, Defendants have violated N.M. Stat. Ann. §§ 57-12-3, et seq.

451. Defendants entered into a contract, combination, or conspiracy between two or more persons in restraint of, or to monopolize, trade or commerce in the DRAM market, a substantial part of which occurred within New Mexico.

452. Defendants established, maintained, or used a monopoly, or attempted to establish a monopoly, of trade or commerce in the Relevant Markets, a substantial part of which occurred within New Mexico, for the purpose of excluding competition or controlling, fixing, or maintaining prices in the DRAM Market.

453. Defendants' conduct was unfair, unconscionable, or deceptive within the conduct of commerce within the State of New Mexico.

454. Defendants' conduct misled consumers, withheld material facts, and resulted in material misrepresentations to Plaintiffs and members of the class.

455. Defendants' unlawful conduct substantially affected New Mexico's trade and commerce.

456. Defendants' conduct constituted "unconscionable trade practices" in that such conduct, inter alia, resulted in a gross disparity between the value received by the New Mexico class members and the price paid by them for DRAM as set forth in N.M. Stat. Ann. § 57-12-2E.

457. Defendants' conduct was willful.

458. As a direct and proximate cause of Defendants' unlawful conduct, the Plaintiffs and the members of the New Mexico Class have been injured in their business or property and are threatened with further injury.

459. By reason of the foregoing, Plaintiffs and members of the New Mexico Class are entitled to seek all forms of relief, including actual damages or up to \$300 per violation, whichever is greater, plus reasonable attorney's fees under N.M. Stat. Ann. §§ 57-12-10.

SEVENTEENTH CLAIM FOR RELIEF

**Violation of the Oregon Unlawful Trade Practices Act,
Or. Rev. Stat. § 646.605, *et seq.*
(On Behalf of the Oregon Class)**

460. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

461. By reason of the conduct alleged herein, Defendants have violated Or. Rev. Stat. § 646.608, *et seq.*

462. Defendants have entered into a contract, combination, or conspiracy between two or more persons in restraint of, or to monopolize, trade of commerce in the DRAM Market, a substantial part of which occurred within Oregon.

463. Defendants established, maintained, or used a monopoly, or attempted to establish a monopoly, of trade or commerce in the DRAM Market, for the purpose of excluding or limiting competition or controlling or maintaining prices, a substantial part of which occurred within Oregon.

464. Defendants' conduct was conducted with the intent to deceive Oregon consumers regarding the nature of Defendants' actions within the stream of Oregon commerce.

465. Defendants' conduct was unfair or deceptive within the conduct of commerce within the State of Oregon.

466. Defendants' conduct misled consumers, withheld material facts, and had a direct or indirect impact upon Plaintiffs and members-of-the-Classes' ability to protect themselves.

467. Defendants' unlawful conduct substantially affected Oregon's trade and commerce.

468. As a direct and proximate cause of Defendants' unlawful conduct, the Plaintiffs and the members of the Oregon Class have been injured in their business or property and are threatened with further injury.

1 469. By reason of the foregoing, the Plaintiffs and the members of the Oregon Class are
2 entitled to seek all forms of relief available under Or. Rev. Stat. § 646.638.

3 470. Pursuant to § 646.638 of the Oregon Unlawful Trade Practices Act, with the filing of
4 this action, a copy of this Complaint is being served upon the Attorney General of Oregon.

5
6 **EIGHTEENTH CLAIM FOR RELIEF**

7 **Violation of the Utah Consumer Sales Practices Act,**
8 **Utah Code Ann. §§ 13-11-1, *et seq.***
9 **(On Behalf of the Utah Class)**

10 471. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above
11 paragraphs as if fully set forth herein.

12 472. By reason of the conduct alleged herein. Defendants have violated Utah Code Ann. §§
13 13-11-1, *et seq.*

14 473. Defendants entered into a contract, combination, or conspiracy between two or more
15 persons in restraint of, or to monopolize, trade or commerce in the DRAM market, a substantial part
16 of which occurred in Utah.

17 474. Defendants are suppliers within the meaning of Utah Code Ann. §§ 13-11-3.

18 475. Defendants established, maintained, or used a monopoly, or attempted to establish a
19 monopoly, of trade or commerce in the Relevant Markets, a substantial part of which occurred within
20 Utah, for the purpose of excluding competition or controlling, fixing, or maintaining prices in the
21 DRAM Market.

22 476. Defendants' conduct was unfair, unconscionable, or deceptive within the conduct of
23 commerce within the State of Utah.

24 477. Defendants' conduct and/or practices were unconscionable and were undertaken in
25 connection with consumer transactions.

26 478. Defendants knew or had reason to know that their conduct was unconscionable.
27
28

479. Defendants' conduct misled consumers, withheld material facts, and resulted in material misrepresentations to Plaintiffs and members of the Class.

480. Defendants' unlawful conduct substantially affected Utah's trade and commerce.

481. As a direct and proximate cause of Defendants' unlawful conduct, the Plaintiffs and the members of the Utah Class have been injured in their business or property and are threatened with further injury.

482. By reason of the foregoing, the Plaintiffs and the members of the Utah Class are entitled to seek all forms of relief, including declaratory judgment, injunctive relief, and ancillary relief, pursuant to Utah Code Ann. §§ 13-11-19(5) and 13-11-20.

NINETEENTH CLAIM FOR RELIEF

Violation of the Utah Unfair Practices Act, Utah Code Ann. §§ 13-5-1, *et seq.* (On Behalf of the Utah Class)

483. Indirect Purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

484. By reason of the conduct alleged herein, Defendants have violated Utah Code Ann. §§ 13-5-1, *et seq.*

485. Defendants entered into a contract, combination, or conspiracy between two or more persons in restraint of, or to monopolize, trade or commerce in the DRAM market, a substantial part of which occurred in Utah.

486. Defendants established, maintained, or used a monopoly, or attempted to establish a monopoly, of trade or commerce in the relevant markets, a substantial part of which occurred within Utah, for the purpose of excluding competition or controlling, fixing, or maintaining prices in the DRAM market.

487. Defendants' conduct caused or was intended to cause unfair methods of competition within the State of Utah.

488. Defendants' unlawful conduct substantially affected Utah's trade and commerce.

489. As a direct and proximate cause of Defendants' unlawful conduct, the Plaintiffs and the members of the Utah Class have been injured in their business or property and are threatened with further injury.

490. By reason of the foregoing, the Plaintiffs and the members of the Utah Class are entitled to seek all forms of relief, including actual damages or \$2000 per Utah Class member, whichever is greater, plus reasonable attorneys' fees under Utah Code Ann. §§ 13-5-14, et seq.

TWENTIETH CLAIM FOR RELIEF

Violation of the Virginia Consumer Protection Act Va. Code Ann. § 59.1- 196, et seq. (On Behalf of the Virginia Class)

491. Plaintiffs incorporate and reallege, as though fully set forth herein, each and every allegation set forth in the preceding paragraphs of this Complaint.

492. By reason of the conduct alleged herein, defendants have violated Va. Code Ann. § 59.1- 196, et seq.

493. Defendants entered into a contract, combination, or conspiracy between two or more persons in restraint of, or to monopolize, trade or commerce in the DRAM market, a substantial part of which occurred within Virginia.

494. Defendants established, maintained, or used a monopoly, or attempted to establish a monopoly, of trade or commerce in the DRAM market, a substantial part of which occurred within Virginia, for the purpose of excluding competition or controlling, fixing, or maintaining prices in the DRAM market.

495. Defendants' conduct caused or was intended to cause unfair methods of competition within the State of Virginia.

496. Defendants' unlawful conduct substantially affected Virginia's trade and commerce.

497. As a direct and proximate cause of defendants' unlawful conduct, Plaintiffs and the members of the Virginia Class have been injured in their business or property and are threatened with further injury.

498. By reason of the foregoing, Plaintiffs and the members of the Virginia Class are entitled to seek all forms of relief, including actual damages, treble damages, plus reasonable attorney's fees under Virginia Code Ann. § 59.1-196, *et seq.*

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs and Class members pray for relief as set forth below:

A. Certification of the action as a class action pursuant to Federal Rule of Civil Procedure 23, and appointment of Plaintiffs as Class Representatives and their counsel of record as Class Counsel;

B. A declaration that Defendants' conduct constituted an unlawful restraint of trade in violation of the federal and state statutes alleged herein and that Defendants are liable for the conduct or damage inflicted by any other co-conspirator.

C. Restitution and/or damages to Class members for their purchases of products containing DRAM at inflated prices;

D. Actual damages, statutory damages, punitive or treble damages, and such other relief as provided by the statutes cited herein;

E. Pre-judgment and post-judgment interest on such monetary relief;

F. Equitable relief in the form of restitution and/or disgorgement of all unlawful or illegal profits received by Defendants as a result of the anticompetitive conduct alleged herein;

G. An injunction against Defendants, their affiliates, successors, transferees, assignees, and other officers, directors, partners, agents and employees thereof, and all other persons acting or

1 claiming to act on their behalf or in concert with them from in any manner continuing, maintaining,
2 or renewing the conduct, contract, conspiracy, or combination alleged herein, or from entering into
3 any other contract, conspiracy, or combination having a similar purpose or effect, and from adopting
4 or following any practice, plan, program or device having a similar purpose or effect

5 H. The costs of bringing this suit, including reasonable attorneys' fees; and

6 I. All other relief to which Plaintiffs and Class members may be entitled at law or in
7 equity.

8 **DEMAND FOR JURY TRIAL**

9 Plaintiffs on behalf of themselves and all others similarly situated hereby demand a trial by
10 jury, pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, on any and all claims and issues
11 so triable.

12 DATED May 3, 2021

HAGENS BERMAN SOBOL SHAPIRO LLP

13
14 By s/ Benjamin J. Siegel
BENJAMIN J. SIEGEL (256260)

15 Rio S. Pierce (298297)
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